Transportation Safety Board
of Canada

Bureau de la securite des transports
du Canada

Aviation Occurrence Reports

Issue 11

91-03254/

AVIATION OCCURRENCE REPORTS

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Cat. No. TU2-3 / 11E

FOREWORD

AVIATION OCCURRENCE REPORTS

On March 29, 1990, the Transportation Safety Board of Canada (TSB) took over the responsibilities of the Canadian Aviation Safety Board (CASB). The Aviation Occurence Reports contained in this issue were completed by the CASB prior to the changeover. The responsibility for making these reports public now rests with the transportation safety board.

In accordance with the CTAISB Act, part of the Board's objective is to report publicly on its investigations, on the related findings, and on any recommendations designed to eliminate or reduce safety deficiencies.

The Aviation Occurrence Reports publication contains reports on CASB investigations, findings, and recommendations adopted by the Board and occurrence briefs. The sole intent in providing this information is to advance aviation safety. It is not the object of the Board to determine or apportion any blame or liability in connection with aviation occurrences.

This publication contains reports of aviation occurrences, in Canada, involving Canadian or foreign-registered aircraft. Anyone wanting to employ the Aviation Occurrence Reports for purposes other than advancing aviation safety could find the information incomplete.

This publication is also available in French.

A limited number of copies of this publication are retained and are available from:

Transportation Safety Board of Canada
P.O. Box 9120 Alta Vista Terminal
Ottawa, Ontario
K1G 3T8

Cette publication est également disponible en français.

On peut obtenir des exemplaires de la présente publication en nombre limité auprès du:

Bureau de la sécurité des transports du Canada
C.P. 9120 Terminus postal Alta Vista
Ottawa (Ontario)
K1G 3T8

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EXPLANATORY NOTES

TYPES OF REPORTS

The TSB currently produces four types of occurrence reports: there are three investigation report formats and the brief. the most common investigation report format is the summary report which summarizes the details of the investigation in one or two pages. Intermediate reports are somewhat longer and more detailed. For both these types, the complete public report is reproduced in this publication. More factual information is available on summary and intermediate reports and can be obtained by contacting the TSB and referencing the report number. A small number of investigations (generally 15 to 20 per year) result in International Civil Aviation Organization (ICAO) format reports. For the latter type of report, only the synopsis and the conclusions and recommendations sections of the report are included in this publication. The full report can be obtained by contacting the TSB and referencing the report number (which is included with the synopsis). An aviation occurrence brief is a short narrative history of the flight and occurrence. It includes pertinent information based on a report by the pilot or operator of the aircraft. Laboratory reports, if laboratory analysis has been carried out, are available for all three categories of reports and can be obtained in the same manner.

GROUPING OF REPORTS

For ease of reference, the reports in this publication are grouped by broad category of aircraft type and by type of operation within each group. the reports are then presented chronologically (by the date of the occurrence) within each subgroup.

For fixed-wing conventional aircraft, the subgroup is Public Transportation. This includes scheduled, other unit toll, and charter operations. Note that this subgroup is further divided into occurrence involving (i) aircraft of 5 700 kg (12,500 lb) or over and (ii) aircraft under 5 700 kg (12,500 lb). The second subgroup is Commercial Training. This includes licensed flying clubs and commercial specialty training (commercial licence classes 6 and 7, respectively). All other types of fixed-wing aircraft commercial operations are grouped under Other Commercial Operations. The Private Aircraft subgroup includes all privately registered aircraft, both personal and corporate. It is further subdivided according to type of landing gear. The final subgroup contains occurrences involving state-owned aircraft.

For the rotary-wing category, there are fewer aircraft and fewer occurrences. Thus, only three subgroups are used, viz. Commercial, Private, and State.

The final category contains reports and briefs for all other types. This includes amateur-built aircraft, ultralights, gliders, balloons, etc.

CONTENTS OF SUMMARY REPORTS AND INTERMEDIATE REPORTS

Information on Aircraft:

The first block of each report identifies the type of aircraft involved in the occurrence, the model, the registration, the location, and the date of the occurrence; for commercially operated aircraft, the operator is also identified.

Occurrence Report Number:

The second block commences with the occurrence report number (any queries to the TSB should carry this reference). The first two numbers identify the year of the occurrence, the first letter identifies the TSB office that conducted the investigation ('A' - Atlantic, 'Q' - Quebec, 'O' - Ontario, 'C' - Central, 'W' - Western, 'P' - Pacific, 'H' - Head Office). The first number after the letter identifies the year of the decade of the occurrence. This block also contains information on the type of investigation (a correspondence investigation is one in which the site of the occurrence was not visited by a TSB investigator), the time of the occurrence, the type of operation, the extent of damage to the aircraft, and the type of licence held by the pilot.

Pilot Hours:

This block indicates the total number of hours the pilot had acquired on all types of aircraft, the total number of hours on type, and number of hours flown in the last 90 days (in total and on type).

Injuries:

The injuries sustained by the crew, passengers, or others are classified as Fatal, Serious, or Minor/None (See Definitions).

Summary Report Narrative:

The narrative summarized the history of the flight, pertinent factual information and analysis. The narrative is divided into two parts:

(a) the factual information or a description of what happened, which begins with a description of the history of the flight as close as possible to the occurrence, followed by the pertinent information; and

(b) an analysis of why the occurrence happened.

Reported Circumstances: (Briefs only)

The narrative summarizes the pertinent information based on a report by the pilot or operator of the aircraft.

Findings: (Reports only)

The Board's findings from an investigation are grouped under two subheadings as follows:

Cause-Related Findings: Any element of the occurrence, found during the investigation which, if removed, would have prevented the occurrence, or, if removed, would have avoided or reduced damage to property and people.

Other Findings: Information, discovered during the investigation of an occurrence, which is not cause related but has the potential to enhance or degrade aviation safety.

Safety Action:

For all aviation occurrence investigations, relevant data are recorded to facilitate statistical analysis and the identification of system-wide safety deficiencies through safety studies. In cases where an individual occurrence investigation leads to significant safety action being taken, that action is included in the public report immediately after the findings.

DEFINITIONS

(Extracted from the Canadian Transportation Accident Investigation and Safety Board (CTAISB) Act/Regulations)

"AVIATION OCCURRENCE"

(a) any accident or incident associated with the operation of aircraft, and

(b) any situation or condition that the Board has reasonable grounds to believe could, if left unattended, induce an accident or incident as described in paragraph (a).

"ACCIDENT"

"ACCIDENT" means any aviation occurrence where, at any time during the period commencing when the first person boards an aircraft for the purpose of flight and ending when the last person disembarks from the aircraft after the flight,

(a) a person other than a stowaway, sustains a serious injury or fatal injury, that is not self-inflicted or inflicted by another person or caused by natural causes, as a result of that person

- i) being in the aircraft,
- ii) coming in direct contact with any part of the aircraft, including any part that may have become detached from the aircraft, or
- iii) being directly exposed to the jet blast of the aircraft,

(b) the aircraft sustains damage or structural failure adversely affecting the structural strength, performance or flight characteristics of the aircraft and normally requiring major repair or replacement of any affected component part, other than damage or failure that is limited to

- i) the engine, its cowling, or its accessories,
- ii) the propellers, wing tips, antennae, tires, brakes or fairings, or
- iii) small dents or puncture holes in the aircraft skin, or

(c) the aircraft is missing or is completely inaccessible.

"SERIOUS INJURY"

"SERIOUS INJURY" means an injury that is sustained by a person in an accident and that

(a) requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was sustained,

(b) results in a fracture of any bone, other than a simple fracture of the nose or of any fingers or toes,

(c) involves lacerations that cause severe haemorrhage or nerve, muscle or tendon damage,

(d) involves injury to any internal organ, or

(e) involves second or third degree burns, or any burns affecting more than five per cent of the body surface.

"INCIDENT"

"INCIDENT" means an aviation occurrence, other than an accident, that affects or could affect the safe operation of an aircraft. Incidents can be reported to the TSB through mandatory or voluntary reporting mechanisms.

According to the CTAISB regulations a "reportable incident" means any incident involving an aircraft with a maximum certified take-off weight greater than 5 700 kg where

(a) an engine fails,

(b) smoke or fire occurs, other than an engine fire that is contained within the engine and does not result in engine failure or damage to other component parts of the aircraft,

(c) difficulties in controlling the aircraft in flight are encountered due to any aircraft system malfunction, weather phenomena, wake turbulence, operations outside the approved flight envelope, or uncontrolled vibrations,

(d) the aircraft fails to remain within the intended landing or take-off area, lands with one or more landing gear retracted, or drags a wing tip or engine pod,

(e) any crew member is unable to perform his flight duties as a result of incapacitation,

(f) decompression, explosive or otherwise, occurs that necessitates an emergency descent,

(g) a fuel shortage occurs that necessitates a diversion or requires approach and landing priority at the destination of the aircraft,

(h) the aircraft is refuelled with the incorrect type of fuel or contaminated fuel that is undetected prior to departure from the ramp,

(i) a collision or risk of collision with any other aircraft or with any vehicle, terrain or obstacle occurs, including a collision or risk of collision that may be related to air traffic control procedures or equipment failures,

(j) a flight crew member declares an emergency or indicates any degree of emergency that requires priority handling by an air traffic control unit or the standing by of a crash, fire fighting or rescue services, or

(k) toxic gases or corrosive materials leak from any cargo aboard the aircraft.

RISK OF COLLISION BETWEEN:
BOEING 747 N742PA and
BOEING 747 N304TW
URANIUM CITY, SASKATCHEWAN 20 mi S
14 JUNE 1988

REPORT NUMBER: 88-W0113 (Incident)
LOCAL TIME: 1140 MDT
INFORMATION SOURCE: Office Investigation

BOEING 747 FLT PAA121 N742PA

OPERATOR: Pan American World Airways Inc.
OPERATION: Scheduled International
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	14,888	8,410	6,518	3,708
LAST 90 DAYS	104	104	88	88

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	14
PASSENGERS	-	-	368

BOEING 747 FLT TWA761 N304TW

OPERATOR: Trans World Airlines Inc.
OPERATION: Scheduled International
DAMAGE: None
PILOT: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		FIRST OFFICER	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	16,246	4,182	15,158	10,744
LAST 90 DAYS	143	143	226	226

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	15
PASSENGERS	-	-	289

HISTORY OF THE FLIGHT:

The Edmonton Area Control Centre (ACC) was expecting two aircraft to pass over Uranium City, Saskatchewan, at approximately 1745 Coordinated Universal Time (UTC). One was a Pan American World Airways Boeing 747, PAA121, out of London, England en route to Los Angeles, California. The aircraft was to enter Canada's airspace at 70°00′N, 060°00′W, then proceed via Alfa track to 64°30′N, 100°00′W, Lateral I to Uranium City, then flight-planned routes to Los Angeles, California. PAA121 was at flight level 330 (FL330), and the crew was requesting higher altitude en route. The other aircraft was a Trans World Airlines Boeing 747, TWA761, out of London, England en route to Los Angeles via company routes to 64°30′N, 100°00′W, Lateral I to Uranium City, then flight-planned routes to Los Angeles at FL350.

At 1743 UTC, PAA121 reported by the Uranium City non-directional beacon (NDB) at FL330 and was cleared to maintain FL350. At 1745:19 UTC, PAA121, which was at FL340 and climbing, was recleared back to FL330. At 1745:35 UTC, TWA761 reported by the Uranium City NDB at FL350. Both aircraft were in a non-radar environment on instrument flight rules (IFR) flight plans, but in visual meteorological conditions (VMC). The crew of TWA761 had PAA121 in sight at the time of the occurrence.

PERTINENT INFORMATION:

PAA121 was cruising at a wrong altitude for its direction of flight and had requested a higher altitude earlier into the flight. The controllers at the Edmonton ACC were aware of the aircraft's wrong-way altitude and had been instructed by their management to get the aircraft at the correct altitude as soon as possible. According to Operations Letter 6/88, failure to do so could result in the controller being "dealt with promptly and decisively." (When such altitude changes are required, the controllers have been trained to get the aircraft "up" to the correct altitude, in order to conserve fuel.)

The minimum separation required for aircraft at the same altitude in a non-radar environment is 15 minutes.

The Northern Control Area South (NCAS) sector is a reasonably busy sector without radar coverage. As a result, the NCAS was split into two altitude levels, NCAS Low and NCAS High, effective 30 May 1988. The vertical limits of the NCAS Low are FL290 to FL330 inclusive, while the NCAS High vertical limits are FL350 and above.

The controller of the PAA121 flight was working the NCAS Low Sector and did not have the authority to clear PAA121 to flight level 350 without first coordinating the clearance with the NCAS High Sector controller. At the time of the occurrence, the NCAS Low Sector controller had been on duty for approximately six hours but had only been controlling the NCAS Low Sector for about two hours. The traffic in the Low Sector was described as light. This was only the second time that the controller had worked the Low Sector. Before the High and Low NCAS Sectors came into effect, this controller had been working the total sector for several years and had had the authority to control all traffic from FL290 up.

ANALYSIS:

When PAA121 reported by the Uranium City NDB, the NCAS Low Sector controller knew the aircraft was at a wrong-way altitude. Because of his years of experience controlling all altitudes in his sector, he immediately cleared the flight to FL350. He was also well aware of the Operations Letter 6/88, stating that those who did not comply with the letter would be dealt with promptly and decisively. Approximately two minutes later, the controller, remembering that he no longer had the authority to clear an aircraft above FL330, coordinated with the NCAS High Sector controller and re-cleared PAA121 down to FL330. As a result of his error, the two Boeing 747s lost vertical and longitudinal separation.

CONCLUSIONS:

Findings:

1. There is no radar coverage at the Uranium City NDB.

2. Traffic in the NCAS Low Sector was assessed as light.

3. The NCAS Sector had been split into a High and Low Sector two weeks prior to the incident.

4. The Low sector controller had only worked the Low sector once since its inception. Prior to the split, the controller had the authority to control all aircraft in his sector from FL290 up.

5. Both aircraft were on IFR flight plans but in VMC conditions. The second Boeing 747 had the lead 747 in sight at the time of the occurrence.

6. The NCAS Low Sector controller failed to coordinate with the NCAS High Sector controller prior to clearing PAA121 to FL350, resulting in a loss of vertical and longitudinal separation between the aircraft.

7. The NCAS Low Sector controller recognized his mistake and took immediate corrective action.

8. While attempting to establish PAA121 at an altitude appropriate to the direction of flight, the NCAS Low Sector controller inadvertently overlooked the requirements to coordinate the altitude change.

Causes:

The NCAS Low Sector controller inadvertently cleared an aircraft from his sector to the NCAS High Sector without proper coordination with the High Sector controller.

* * * * *

ONTARIO EXPRESS LTD.
BRITISH AEROSPACE JETSTREAM 31 C-GJPX
WINDSOR AIRPORT, ONTARIO
07 MARCH 1988

REPORT NUMBER: 88-O/0089 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0808 EST
OPERATION: Domestic Scheduled
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	6,020	700	3,200	700
LAST 90 DAYS	240	240	290	290

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	18

SUMMARY REPORT:

The aircraft landed at Windsor Airport after a scheduled one-hour flight from Toronto, Ontario. Upon deplaning, the baggage handler detected a burning odour in the belly baggage pod and noted that an interior light was on. The heat from the light had burned through the protective lens and into a piece of luggage which was found smouldering. The baggage did not ignite but the potential existed for an in-flight fire.

The lighting system was furnished with a GE #307 bulb and a pyrex glass lens; however, as this lens was susceptible to damage, the manufacturer replaced it with a .125-inch-thick plexiglass-type lens. The light in the belly baggage pod is activated manually with an ON/OFF switch located in the aft cabin. Closing the baggage pod door does not de-activate the light.

CONCLUSIONS:

Findings:

1. The light in the belly baggage pod was left on for the duration of the flight.

2. The heat from the light had burned through the protective lens and into a piece of luggage.

3. Closing the baggage pod door does not de-activate the lighting system.

4. This hazardous situation was a result of cargo being in direct contact with the illuminated baggage pod light.

Causes:
The belly baggage pod light was on during flight. Heat generated by the bulb caused material it was in contact with to smoulder.

SAFETY ACTION:

Action Taken:
The baggage pod manufacturer introduced Service Bulletins recommending replacement of the plexiglass lens with a protected Pyrex glass lens and a baggage door micro-switch wiring modification. Incorporation of the micro-switch modification will inhibit the baggage pod light when the baggage pod door is closed and locked.

* * * * *

NORTHWEST TERRITORIAL AIRWAYS
DOUGLAS DC-3 C-FNTF
YELLOWKNIFE, NORTHWEST TERRITORIES
15 APRIL 1988

REPORT NUMBER: 88-W0065 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1810 MDT
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	5,300	2,000	2,400	1,620
LAST 90 DAYS	160	160	200	200

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	21

SUMMARY REPORT:

The DC-3 (Flight 972) was descending on Airway V339 on an instrument flight rules (IFR) flight to the Yellowknife Airport from Fort Simpson, Northwest Territories. The Edmonton Area Control Centre (ACC) cleared the flight to maintain 3,500 feet above sea level (asl). The pilot descended to, and reported level at, 3,500 feet and subsequently descended to 1,900 feet without clearance from Edmonton ACC.

There was scattered cloud based at 1,500 feet above ground level, overcast cloud estimated at 6,000 feet, the visibility was four miles, there was light snow, and the wind was from 010 degrees at 15 with gusts to 25 knots.

At 2352 Coordinated Universal Time (UTC), Flight 972 was cleared to maintain 3,500 feet and was instructed by the controller to plan an approach for runway 33. At 2357 UTC, the pilot reported level at 3,500 feet 30 miles from the Yellowknife Airport. The controller gave the pilot the option of either proceeding direct to the Yellowknife NDB for a full instrument landing system (ILS) approach or flying to the Yellowknife NDB via the 12 mile arc from his present position. The pilot chose the latter and wasthen cleared to the Yellowknife NDB via the published 12 DME arc transition for runway 33.

At 0003 UTC, the controller sequenced Flight 972 number two for the approach because faster traffic was inbound from the north. At 0007 UTC, Flight 972 was cleared, upon reaching the Yellowknife NDB, to hold south on the localizer and was given an expected approach time. The controller did not restate the holding altitude when the clearance was issued, nor is he required to by the Air Traffic Control Manual of Operations (MANOPS) 464.1 The pilot acknowledged the holding clearance but did not read it back to the controller, as is required by Air Regulation 506. The controller did not obtain a readback from the pilot, as is required by MANOPS 201.5 and 416.1.

At 0012 UTC, Flight 972 reported level at 1,900 feet, the minimum en route altitude for the DME arc transition, as published in the Canadian Air Pilot (CAP). The controller queried this, then advised the pilot that his last assigned altitude was 3,500 feet. The pilot acknowledged, climbed to 3,500 feet, and reported level.

An approach clearance to the Yellowknife Airport would have permitted descent to 1,900 feet, as published in the CAP. However, clearance to the Yellowknife NDB and the subsequent holding clearance required the pilot to maintain the last assigned altitude of 3,500 feet until he received the approach clearance or until the controller assigned a new altitude.

When instructed to plan an approach for runway 33, the pilot was prompted to prepare for an approach clearance. Upon intercepting the 12 DME arc for the published 12 DME arc transition to Yellowknife NDB, the pilot descended to the published minimum en route altitude of 1,900 feet for an ILS approach runway 33 because he thought he had approach clearance.

CONCLUSIONS:

Findings:

1. The controller did not restate the altitude when issuing the holding clearance. Restating the altitude is not required.

2. The pilot did not read back the holding clearance when it was issued by the controller, as required by regulation.

3. The controller did not obtain a readback of the holding clearance from the pilot, as required by regulation.

4. The pilot misunderstood the clearance and descended below the last assigned altitude.

Causes:

The pilot misunderstood the holding clearance and descended below the authorized altitude.

* * *

AIR B.C.
DE HAVILLAND DHC-7 C-GFEL
VANCOUVER, BRITISH COLUMBIA
22 MAY 1988

REPORT NUMBER: 88-P0097 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1820 PDT
OPERATION: Domestic Scheduled
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	12,000	1,105	2,500	350
LAST 90 DAYS	195	195	185	185

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	4
PASSENGERS	-	-	46

SUMMARY REPORT:

The captain and co-pilot arrived at the flight line approximately 30 minutes prior to scheduled departure time for a flight to Victoria, British Columbia and completed all pre-flight checks. One of those checks was to zero the fuel gauge indications and note that the gauges returned to indicate the proper fuel quantity. When this check was completed, the number one fuel tank gauge indicated 1,400 pounds while the other three gauges all indicated 1,200 pounds. On take-off from Vancouver International Airport, the number one TANK FUEL LOW caution light momentarily flickered on and went off. After the aircraft had reached cruise altitude, the caution light again flickered on and again went off. Approximately five minutes later, the caution light illuminated again and remained on. The captain checked the fuel indications, zeroed the tank gauges, and noted that the number one fuel gauge tank indication was 1,200 pounds and that the other three tanks indicated 1,000 pounds. Approximately two minutes after the number one TANK FUEL LOW caution light illuminated and remained on, the fuel low pressure warning light on the number one engine illuminated, followed immediately by a loss of power on the number one engine and automatic feathering of the number one engine propeller. The pilot informed the passengers of the engine shutdown and returned to Vancouver International Airport where an uneventful landing was completed.

The weather at the time was high scattered clouds with good visibility. The surface temperature was 18 degrees Celsius.

After shutdown, the number one fuel tank was dipped and found to be empty. The aircraft had been refuelled from the single point adapter located under the rear fuselage. There are four fuel quantity gauges at that location, one for each of the four fuel tanks. These gauges indicate the fuel level reached when the aircraft was last refuelled. When power is applied to the refuelling system in order to refuel the aircraft, the indications decrease until they match the cockpit gauge indications. A moveable bug on each gauge can be set by the refueller to the desired quantity level, and, during refuelling, when the fuel indicator needle matches the bug, fuel to that tank is shut off automatically.

When the system was powered for refuelling prior to this flight, the number one tank indication decreased to 1,000 pounds while the indications for tanks two, three, and four each decreased to approximately 600 pounds. During refuelling, the number one tank automatically stopped taking fuel first. When refuelling was completed, the fuel tank repeater gauges indicated 1,200 pounds of fuel in each of the four tanks.

The TANK FUEL LOW warning light switch is activated by a float in the fuel tank when the fuel in that tank decreases to approximately 105 pounds. Depending on engine power setting, this amount of fuel provides 12 to 18 minutes of engine operation before the fuel tank runs dry. Following this incident, the number one TANK FUEL LOW warning system was tested, and it activated with 150 pounds of fuel remaining in the tank.

The fuel quantity indicating system for each tank includes a master indicator and five probes. Following the incident, the fuel quantity indicating system was checked, and an error of approximately 1,000 pounds was found in the cockpit fuel quantity gauge for the number one tank. This error was repeated by the gauge located at the refuelling point. The cockpit gauge was replaced, and the system checked serviceable.

The momentary illuminations of the TANK FUEL LOW warning light did not unduly concern the captain because the number one fuel gauge indicated there was adequate fuel in the tanks. When the warning light illuminated and stayed on, the pilot attributed the problem to a faulty electrical system. Consequently, he did not transfer fuel from one of the other three tanks into the number one tank.

Since there were no discrepancies found in the number one fuel tank low level warning system, the reason the engine stopped approximately two minutes after the low level warning light illuminated rather than the expected 12 to 18 minutes could not be determined.

Since the number one fuel tank cockpit gauge was in error by 1,000 pounds (the error was repeated on the refuelling gauge), and the bug was set at 1,200 pounds during refuelling, only 200 pounds of fuel was added to that tank before refuelling was automatically terminated. This fuel, plus the residual fuel in the tank, provided enough fuel for start, taxi, take-off, and climb before all the fuel was burned, and the engine stopped because of fuel starvation.

CONCLUSIONS:

Findings:

1. The cockpit fuel quantity gauge for the number one tank overread by approximately 1,000 pounds.

2. Only 200 pounds of fuel was added to the number one tank because of the faulty cockpit fuel gauge.

3. Because the fuel gauge indicated 1,200 pounds when the fuel low level light came on, the pilot attributed the warning light to an electrical problem.

4. The number one engine stopped because of fuel starvation.

Causes:
The number one fuel tank cockpit gauge was not serviceable.

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PERIMETER AIRLINES LIMITED
BEECHCRAFT A-65 QUEEN AIR C-FBOY
WINNIPEG INTERNATIONAL AIRPORT, MANITOBA
23 MAY 1988

REPORT NUMBER: 88-C0087 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0620 CDT
OPERATION: Regular Specific Point
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,100	383
LAST 90 DAYS	300	300

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

HISTORY OF THE FLIGHT:

The pilot, with three passengers on board, departed from the Winnipeg International Airport on a regularly scheduled flight to St. Theresa Point, Manitoba. Shortly after take-off from runway 36, at an altitude of 1,400 feet above ground level, the pilot heard a loud noise and felt the aircraft suddenly yaw to the left. The pilot noticed that the front portion of the left engine inboard cowling door had opened up. The door vibrated violently for a few seconds, then tore free, breaking one of the cabin windows before it fell clear of the aircraft. The pilot notified the control tower of the problem, returned to the airport, and landed safely.

PERTINENT INFORMATION:

This was the first flight after maintenance had been performed on the left engine to change the two push rod tube seals on the front inboard cylinder. After this, the engine was washed down and the inboard cowling was closed.

The pilot completed his normal pre-flight inspection, part of which was to check the cowlings for security; he noticed nothing unusual. After he started the left engine, the pilot visually checked the engine, and again everything appeared normal.

The inboard cowl door is hinged at the top of the cowl. When the cowl door is closed, four latches on the lower cowl are engaged with four hooks mounted on the inboard cowl door. The latches are then secured to the lower cowl with a Dzus fastener which is turned with screwdriver to lock it. When the Dzus fastener is locked, the slot for the screwdriver is horizontal. If the latches are left open, they are clearly visible, even from the pilot's seat.

After the aircraft landed, it was observed that, of the four Dzus fasteners that secure the latches, only the third one from the front was in the locked position. The latch mechanisms and fasteners were checked for wear and found to be in good condition. It was possible for the latches to be closed and the Dzus fasteners turned only part way; this would not fully lock the Dzus fastener but would give the impression that the cowl was secure, if the slot in the Dzus fastener was not confirmed to be in the horizontal position. There were no witness marks to make the position of the Dzus fasteners more obvious, nor was there any equipment for this. It was normal practice for the company pilots and engineers to check that the Dzus fastener slots were horizontal, thus confirming they were locked.

ANALYSIS:

The left engine inboard cowl door separated from the aircraft because three of the four Dzus fasteners were not locked; this was not noticed during the pre- and post-start checks. After take-off, normal vibrations released the unlocked fasteners, allowing the latches to open, and the cowling door tore free.

CONCLUSIONS:

Findings:

1. Shortly after take-off, the left engine inner cowl door opened and tore free.

2. Three of the four Dzus fasteners that secured the cowl latches were not locked.

3. The Dzus fasteners were in good condition and, if secured properly, could not have come undone under normal flight operations.

4. The improperly secured cowl latches went unnoticed during the inspection prior to flight.

Causes:

Three of the four Dzus fasteners that secured the latches on the left engine inner cowl were not locked.

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RISK OF COLLISION BETWEEN:
BOEING 737 C-GCPV and
BEECHCRAFT KING AIR 200 C-GPCD
ST. JOHN'S, NEWFOUNDLAND
15 JUNE 1988

REPORT NUMBER: 88-A0146 (Incident)
LOCAL TIME: 1418 NDT
INFORMATION SOURCE: Field Investigation

BOEING 737 FLT 146 C-GCPV

OPERATOR: Canadian Airlines International
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	13,700	N/A	8,200	N/A
LAST 90 DAYS	120	120	120	120

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	5
PASSENGERS	-	-	N/A

BEECHCRAFT KINGAIR 200 C-GPCD

OPERATOR: Atlantic Airways
OPERATION: Contract
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	3,200	1,500	4,000	1,500
LAST 90 DAYS	200	120	180	120

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	2

HISTORY OF THE FLIGHT:

The Boeing 737 was completing a scheduled flight from Halifax, Nova Scotia to St. John's, Newfoundland, and air traffic control (ATC) had cleared the aircraft for a straight-in instrument landing system (ILS) approach to runway 11. The aircraft was west of the airport, on a long final at 1,500 feet asl, in visual meteorological conditions (VMC).

At the same time, a Beechcraft King Air 200, on a local visual flight rules (VFR) flight, was proceeding from north of the St. John's Airport towards the southwest at 1,500 feet asl. The King Air's intended track crossed the ILS localizer course for runway 11 at nearly a right angle.

When the B737 was 10 miles on final, the King Air pilots saw the B737 at approximately one-quarter to one-half mile, directly ahead of them, and on a collision course. At about the same instant, the B737 pilots saw the King Air. Both crews took evasive action; the King Air descended and turned right, while the B737 climbed and turned right. The King Air passed below the B737 at an estimated distance of between 200 and 300 feet.

PERTINENT INFORMATION:

The St. John's Control Zone is centred on the middle of the airport and is five nautical miles in radius. The near collision occurred outside of the control zone.

Both aircraft had established normal radio communication with St. John's Control Tower.

There were two other aircraft indirectly involved with this occurrence. Two Cherokees had departed runway 16 with right turns after take-off and were proceeding northwest through the area of the B737's final approach to runway 11.

When the King Air crew advised St. John's Control Tower that they would be proceeding to the southwest, the control tower advised them that the B737 was conducting a straight-in approach to runway 11. The tower did not pass the King Air traffic to the B737.

The B737 crew had seen the King Air earlier in their approach but had mistaken it for a Dash 8 landing on runway 16. Just prior to the occurrence, the tower advised the B737 of the two Cherokees, and, while one pilot was looking for the Cherokee traffic, the other was keeping visual contact with the King Air.

The King Air crew had a minor maintenance problem, and they were flying straight and level while waiting word from their ground maintenance on how to handle the situation.

ANALYSIS:

Both aircraft were in a "see-and-be-seen" environment. The King Air crew should have been aware of the B737 but may have been distracted by their maintenance problem.

The B737 crew saw the King Air and mistook it for a Dash 8, a larger type of aircraft, and thought it was further away than it was. They also assumed, that if it was a Dash 8, it would be landing on runway 16, the active runway, and would not interfere with their approach to runway 11. The phenomenon of a visual identification, versus size, versus distance is well known as the "Size Constancy Theory." It will lead pilots into false assumptions on separation distances, especially because of a lack of depth cues while in flight. The tower advised the B737 of the Cherokee traffic but did not report the King Air traffic.

CONCLUSIONS:

Findings:

1. Both aircraft were outside the St. John's Airport Control Zone, and were in a "see-and-be-seen" traffic situation.

2. The tower passed Boeing 737 traffic to the King Air but did not pass the King Air traffic to the Boeing 737.

3. The Boeing 737 crew saw the King Air earlier in their approach but mistook it for a larger aircraft which made it appear farther away.

4. There were two other aircraft in the area which distracted the crew of the B737.

5. Both crews took evasive action to avoid a collision.

Causes:

Traffic information on the King Air was not passed to the B737 crew, and the King Air crew did not see the B737 until the last minute.

* * * * *

RISK OF COLLISION BETWEEN:
DE HAVILLAND DHC-8 DASH 8 C-GTAE and
CESSNA 182Q SKYLANE C-GRUL
VANCOUVER INTERNATIONAL AIRPORT, BRITISH COLUMBIA
17 JUNE 1988

REPORT NUMBER: 88-P0121 (Accident)
LOCAL TIME: 1135 PDT
INFORMATION SOURCE: Field Investigation

DE HAVILLAND DHC-8 DASH 8 C-GTAE

OPERATOR: Time Air Inc.
OPERATION: Regular Specific Point
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	7,500	800	N/A	N/A
LAST 90 DAYS	250	250	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	19

CESSNA 182Q SKYLANE C-GRUL

OPERATION: Private Company Business
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	22,500	600
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

HISTORY OF THE FLIGHT:

When he was inbound from Victoria, the pilot of the Cessna received and acknowledged both his landing clearance for runway 12 and the instruction to hold short of that runway's intersection with runway 08. After the Cessna landed, the tower controller cleared the Dash 8 to take-off position on runway 12 and, while the Cessna was still on the runway, cleared the Dash 8 for take-off. When the pilot of the Cessna heard the take-off clearance for the Dash 8, he turned his aircraft to the left and taxied to the outer edge of the runway. The flight crew of the Dash 8 saw the stationary Cessna aircraft after they were airborne, several hundred feet above the runway.

PERTINENT INFORMATION:

Section 352.3 of the Transport Canada Air Traffic Control Manual of Operations states:

"Separate a departing aircraft from a preceding aircraft using the same runway by ensuring that it does not begin take-off roll until one of the following conditions exists:

A. The preceding aircraft has landed and taxied off the runway or there is every assurance that it will vacate the runway by the time the departure starts the take-off roll."

At the time of the occurrence, runways 08 and 12, as well as the nearby river, were in use for take-offs and landings. The controller's work load, with about 75 aircraft movements an hour, was considered moderate.

After the Cessna had landed, the tower controller passed the flight data strip of the Cessna to the ground controller and then cleared the Dash 8 to taxi into take-off position on the runway behind the landing Cessna. During his subsequent scan of the runway, he did not notice the Cessna stopped on the runway, and he cleared the Dash 8 for take-off. When the pilot of the Cessna aircraft requested clearance across runway 08, the controller realized what had happened, but the Dash 8 was well into its take-off by that time.

The glass panes of the Vancouver tower cab are separated by mullions positioned at regular intervals around the cab; these interrupt the controller's field of view, and the controller has to move around while scanning the runways.

ANALYSIS:

The controller, to move airport traffic expeditiously and to keep up with the moderate amount of traffic, passed on the flight data strip of the landing Cessna aircraft while the aircraft was still under his control. Without this reminder in his possession, he may have forgotten about the aircraft and concentrated on other traffic. Because of the mullion in his line of sight, he did not notice the Cessna when he scanned the runway, and he issued the take-off clearance to the Dash 8.

CONCLUSIONS:

Findings:

1. The controller passed the flight data strip of a landing aircraft to another controller while the aircraft was still under his control.

2. When he scanned the runway, the controller did not notice the Cessna on the runway.

3. The controller issued a take-off clearance to the Dash 8 without assurance that the landing Cessna would vacate the same runway before the Dash 8 started its take-off roll.

4. The mullions between the glass panes of the Vancouver tower cab interrupted the controller's field of view.

Causes:

The controller did not ensure that the runway was free of traffic before issuing a take-off clearance to the Dash 8.

* * *

MUSKEGO AIR SERVICE
CESSNA U206F STATIONAIR C-GEIF
EAGLE ISLAND, MANITOBA 10 mi SE
02 MARCH 1988

BRIEF NUMBER: 88-C0047 (Incident)
LOCAL TIME: 1220 CST
OPERATION: Charter
DAMAGE: None
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

While flying at en route altitude, the pilot heard a loud noise from the engine, and the propeller stopped rotating. The pilot force-landed successfully on the frozen surface of Lake Winnipeg.

The crankshaft had fractured at one of the intermediate connecting rod journals. The fracture faces had been damaged to the extent that the mode of failure could not be determined.

* * *

SABOURIN LAKE AIRWAYS LIMITED
CESSNA A185F SKYWAGON II C-GDSJ
BEARSKIN LAKE, ONTARIO
04 MARCH 1988

BRIEF NUMBER: 88-C0051 (Accident)
LOCAL TIME: 0950 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,020	325
LAST 90 DAYS	50	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The ski-equipped aircraft was taking off from a frozen lake surface when the right ski hit a hard-packed snowdrift. The right gear failed at the fuselage box structure, and the aircraft came to rest nose-down on the fuselage and right wing.

* * *

PA AVIATION
CESSNA 310 C-GRXC
PRINCE ALBERT, SASKATCHEWAN
24 MARCH 1988

BRIEF NUMBER: 88-C0067 (Accident)
LOCAL TIME: 1330 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,200	45
LAST 90 DAYS	150	45

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

During descent through cloud, an area of severe icing was encountered, and ice accumulated on the aircraft. The pilot kept the airspeed high; however, during the flare, the aircraft stalled and struck the runway hard in a left-wing-low attitude. The wind was 340 degrees magnetic at 15 gusting to 20 knots; the aircraft landed on runway 26.

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PRAIRIE FLYING SERVICE (1976) LTD.
CESSNA 401A BUSINESSLINER C-FXWR
REGINA AIRPORT, SASKATCHEWAN
30 MARCH 1988

REPORT NUMBER: 88-C0063 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1945 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	740	95
LAST 90 DAYS	80	80

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

Following the last leg of a four-stage charter flight, the pilot approached to land on runway 30 at Regina Airport, Saskatchewan. On the downwind leg, the landing gear and flaps were selected, and the pilot reported to the tower controller that the landing gear was down and locked. The approach was continued, and the aircraft landed with the landing gear in the retracted position. The aircraft slid to a stop and the pilot exited without injury.

The gear selector lever was found in the DOWN position after the accident. This lever is spring-loaded to the LOCKED position and is released for selection by an outward movement of the wheel-shaped knob. If the knob is released before the lever has reached full down travel, it will remain in an intermediate position, and the landing drive motor will not energize the system. An electro-mechanical system, with a push-to-reset circuit-breaker, is used to raise and lower the landing gear. The pilot noted that the circuit-breaker was in the closed position as he joined the circuit, but it was found to have opened or popped during the landing.

The aircraft was placed on jacks, and the circuit-breaker was reset. The landing gear cycled normally, the landing gear down-and-locked position lights illuminated, and the warning horn system functioned normally. The warning horn is set to activate at 13 inches of manifold pressure or lower. The pilot had conducted the approach using 20 inches of manifold pressure.

The pilot was not suffering from fatigue nor was he otherwise pre-occupied. The angle of the late afternoon sun did not affect the pilot's view of the landing gear warning lights.

The evidence indicated that the landing gear system was serviceable prior to the occurrence. During the approach, the pilot probably did not put the landing gear selector lever to the full-down position, and the gear remained fully retracted. The most likely explanation for the open circuit-breaker is that, immediately prior to touchdown, the pilot selected the landing gear down and the movement of the gear was arrested when the aircraft contacted the runway, resulting in an electrical overload which caused the circuit-breaker to open.

After the pilot initially selected the gear lever down, he did not confirm that the three green down-and-locked lights were illuminated, and the warning horn did not operate because the throttle setting was greater than 13 inches manifold pressure.

CONCLUSIONS:

Findings:
1. The aircraft landed with the landing gear retracted.

2. The landing gear system was serviceable.

3. The landing gear selector lever probably was not placed to the full-down position.

4. The pilot did not check the landing gear safe lights for a down and locked indication before landing.

Causes:
The landing gear was not lowered.

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ORCA AIR LTD.
DHC-2 BEAVER C-FJBP
ADDENBROOK ISLAND, BRITISH COLUMBIA
06 APRIL 1988

REPORT NUMBER: 88-P0061 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0950 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,229	429
LAST 90 DAYS	90	80

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot flew an early morning flight from Port McNeill to Yeo Island, located 15 miles north of Bella Bella, British Columbia. Later in the morning, while attempting to return to Port McNeill with one passenger and 800 pounds of fish on board, the pilot encountered strong, gusty winds, low ceilings, snow squalls, and reduced visibilities. To take advantage of better visibility over the land, the pilot chose to fly across Addenbrook Island. As he approached a ridge of high ground, it became apparent that the aircraft would not clear the top. The pilot started a turn to avoid the terrain when the aircraft suddenly entered a descent which the pilot could not arrest, and the aircraft crashed into the trees. The aircraft was substantially damaged; the pilot and passenger were uninjured.

The pilot was qualified and licensed to fly the aircraft. There were no recorded aircraft unserviceabilities before the flight. The aircraft was loaded near its maximum weight capacity.

Before leaving Port McNeill, the pilot obtained the marine weather forecast, which warned of gale-force winds and showers that would produce snow squalls and reduced visibilities. Marine forecasts normally do not include cloud information.

The pilot reported that, during the previous flight, the weather, although passable, became progressively worse en route to Yeo Island. He expected similar conditions for the return trip; however, he found that the weather had deteriorated.

A wind blowing over high ground usually produces downdrafts on the leeward side. The downdrafts are most severe near the higher ground. The strong winds over Addenbrook Island were blowing across high ground and toward the low-flying aircraft. When the aircraft approached the high ground, the vertical rate of the downflow exceeded the aircraft's ability to maintain level flight, and the pilot was unable to prevent the aircraft from flying into the trees.

CONCLUSIONS:

Findings:
1. The pilot continued VFR flight into deteriorating weather conditions.

2. The pilot attempted to cross a ridge of high ground at too low an altitude for the prevailing wind conditions.

3. Downdrafts near the high ground forced the aircraft to descend, and the pilot was unable to avoid crashing into the trees.

Causes:
The pilot continued flight into deteriorating weather.

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PARSONS AIRWAY NORTHERN LTD.
CESSNA A185F SKYWAGON C-GYOS
LEAK LAKE, MANITOBA
12 APRIL 1988

BRIEF NUMBER: 88-C0071 (Incident)
LOCAL TIME: 1350 CDT
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	941	365
LAST 90 DAYS	223	52

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

After the aircraft touched down on the snow-covered lake, the tail ski struck a rut, twisted sideways, and broke off. The aircraft swung and the left stabilizer struck a snow bank.

* * * * *

PTARMIGAN AIRWAYS LTD.
DEHAVILLAND DHC-6-300 TWIN OTTER
C-GARW
CONCESSION LAKE, NORTHWEST TERRITORIES
14 MAY 1988

REPORT NUMBER: 88-W0082 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0930 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	22,000	13,000	850	600
LAST 90 DAYS	153	67	260	260

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	4

HISTORY OF THE FLIGHT:

The aircraft had been chartered to haul a diamond drill and crew to a remote landing area. The pilot attempted a full-flap short-field landing on a 700-foot-long esker; however, the aircraft touched down in a snow-filled ravine, 65 feet short of the intended landing area. The aircraft ploughed through the deep snow and was damaged when it struck the edge of the esker; the brakes were damaged and the flight controls jammed. The pilot stopped the aircraft on the esker by use of reverse thrust.

PERTINENT INFORMATION:

The pilot had many years experience flying into remote unprepared areas. On the day prior to the accident, he had overflown the esker and determined it to be adequate for the upcoming drill move.

The aircraft was reported to be serviceable and suitable for the intended flight. It had departed Yellowknife at a take-off weight of 12,300 pounds; the landing weight was to be 11,200 pounds. The performance values listed in the aeroplane flight manual, based on landing or taking off over a 50-foot obstacle, show that the esker was of sufficient length for the operation.

As described by the pilot, the wind was from 030 degrees magnetic at eight knots, the temperature was eight degrees Celsius, the sky condition was 1,500 to 2,000 broken, and the visibility was over 10 miles.

The esker was 700 feet long by 65 feet wide. The elevation of the esker was 15 feet higher than the surrounding terrain, and the first 100 feet was sloped up at an average angle of eight degrees. A ravine in the undershoot area was filled with snow.

ANALYSIS:

When the pilot overflew the esker on the day prior to the accident, he did not notice the upslope of the first 100 feet of the strip. During the short-field landing attempt, he was concentrating on the touchdown area. Because of the upslope of the first portion of the strip, the pilot had the illusion that the approach angle was normal when, in fact, the aircraft was undershooting.

CONCLUSIONS:

Findings:

1. The pilot was experienced in short-field landings but had not landed on this particular esker.

2. The first 100 feet of the 700-foot-long esker sloped up about eight degrees; this upslope was not noticed by the pilot.

3. The esker was suitable for the intended operations.

4. The aircraft touched down 65 feet short of the intended landing area.

Causes:

The upslope portion of the strip gave the pilot the illusion that the approach was high, resulting in a lower than normal approach.

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RISK OF COLLISION BETWEEN:
BOEING 727-233 C-GYNH and
FALCON 20 N512T
MONTRÉAL/DORVAL INTERNATIONAL
AIRPORT, QUÉBEC
24 MAY 1988

REPORT NUMBER: 88-Q0131 (Incident)
LOCAL TIME: 1749 EDT
INFORMATION SOURCE: Field Investigation

BOEING 727-233 C-GYNH

OPERATOR: Air Canada
OPERATION: Scheduled International
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	20,000	3,000	10,000	3,500
LAST 90 DAYS	200	200	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	7
PASSENGERS	-	-	66

FALCON 20 N512T

OPERATION: Private Company Business
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	11,640	3,000	N/A	N/A
LAST 90 DAYS	150	100	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	2

HISTORY OF THE FLIGHT:

The crew of the Boeing 727 obtained an instrument flight rules (IFR) clearance from Dorval Clearance Delivery prior to start and were cleared for a departure on runway 24L. Following push-back from Gate 19, the crew requested taxi instructions and were authorized by Dorval Ground Control to taxi to runway 24L. These instructions were acknowledged by the crew. Five seconds after this acknowledgement, the ground controller transmitted an amendment to the taxi instructions changing the runway to 24R via the Echo taxiway. The amendment issued by the ground controller omitted the operator's name before the flight number and contained non-standard phraseology. This amended taxi instruction was not acknowledged by the B727 crew, and they continued to taxi for 24L. There was no further communication between ground control and the B727. As the B727 approached the holding bay of 24L, the crew switched to tower frequency, and the airport controller cleared the B727 to taxi to position on 24R. The crew acknowledged the clearance onto 24R and taxied to position on 24L. Forty seconds later, when the B727 was in position and holding, the airport controller cleared the Falcon 20 to land on 24L. The pilot of the Falcon 20 then asked the airport controller if he wanted the Falcon to go around. The airport controller, realizing that the B727 was on 24L, instructed the Falcon for the overshoot and go-around.

PERTINENT INFORMATION:

The tower and terminal building at Dorval are located approximately midway between the thresholds of runways 06L and 06R. The taxi routes from the gates to the thresholds of runways 24L and 24R are clearly visible from the tower. The distance from the tower to the thresholds of 24L and 24R is approximately two miles. Gate 19 is also visible from the tower. Normally an aircraft departing Gate 19 would turn west if going to 24R and east if going to 24L. At the time of the incident, the weather at Dorval was CAVOK (ceiling and visibility OK) i.e., no cloud below 5,000 feet, visibility six miles or more and no precipitation or thunderstorms.

The data strip in the tower for the B727 flight initially showed the runway as 24L. The runway indicated on the strip was ink amended to 24R when the ground controller transmitted the runway change to the B727 crew. After the incident, a second change was made to the data strip by the ground coordinator, changing the runway back to 24L. These changes were written over top of the previously written information.

From the time the B727 taxied until the incident, the ground controller's workload was moderate with light to moderate traffic volume. The workload increased to moderate to heavy for short periods during this time due to traffic situations requiring special attention.

After the incident, the B727 crew reported that they had not heard the change in the taxi instructions and therefore had not acknowledged the change. When the B727 was cleared to position on the runway, the crew had seen the Falcon 20 on approach and had assumed that the airport controller had sufficient time to depart them prior to the landing of the Falcon 20. The crew could not remember whether they had read back 24R or 24L in response to the clearance to position on the runway.

Following the incident, the ground controller reported that he had been aware that the B727 crew had not received the amended taxi instructions and that he had known that the aircraft was continuing to taxi for 24L. At that point he had decided to cancel the runway change to 24R for the B727. His reason for originally changing the runway to 24R was to keep all the aircraft which expected delays due to traffic flow restrictions, such as the B727, on 24R. He stated that he had forgotten to change the runway on the data strip back to 24L when he had been unable to coordinate the runway change with the B727 crew.

The airport controller could not remember whether he had visually checked the position of the B727 before clearing the aircraft to position on the runway. At this same time, there was a B737 aircraft facing away from the tower in the holding bay for runway 24R. The airport controller issued the landing clearance to the Falcon 20 when the B727 was in position and holding on the runway.

ANALYSIS:

The transmission made by the ground controller to amend the taxi instructions was deficient in two areas. First, the operator's name was not included in the transmission as is required in the Air Traffic Control Manual of Operations (MANOPS) 216.1A. Second, the phraseology used and the format of the transmission were not in accordance with MANOPS 201.7 and 334.2 respectively. Either the transmission amending the taxi instructions was not received by the B727 crew, or it was received and the fact that this transmission was meant for them did not register with the crew. If it was the latter case, then it is likely that a standard transmission, properly prefixed with the operator's name, would have alerted the crew that the transmission was for them.

When the ground controller realized that the B727 had not received the amended taxi instructions and was continuing to taxi for 24L, he neglected to change the runway indicated on the data strip back to 24L. The data strip was then placed in the departure bay, and thus the wrong departure runway was passed to the airport controller. The manner in which the data strip was handled was a contributing factor in this incident because the airport controller relied on the information on the strip without visually confirming it.

In accordance with MANOPS 362.1, a positive transfer of responsibility for control of an aircraft is required between the ground and airport controllers. This was not done by the ground controller. When the ground controller did not initiate the transfer, the crew of the B727 should have requested the transfer before changing to tower frequency.

Weather permitting, visual checks by ground and airport controllers to confirm the location of aircraft on the ground facilitate the orderly and safe flow of ground traffic. In the case of the airport controller, an adequate visual check was not carried out before clearing the B727 to position on the runway. The airport controller may have mistaken the B737 in the holding bay of 24R for the departing B727. In addition, the airport controller did not visually check that 24L was clear before issuing the landing clearance to the Falcon 20.

The B727 crew correctly read back the clearance to position on 24R and yet taxied to position on 24L. This error was likely the result of a psychological phenomenon known as expectation effect. The crew were anticipating a clearance either to position or for take-off as they approached the runway, and they gave a stimulus response to the clearance from the airport controller. The information contained in the clearance fundamentally fit the mental model which the crew had; that is, it was a clearance to position on a runway, and the actual runway given by the controller became insignificant. In addition, the distraction to the B727 crew provided by the aircraft on final approach may have been a factor which contributed to the error-making process.

CONCLUSIONS:

Findings:

1. The ground controller issued an amendment to the taxi instructions using non-standard phraseology and an incorrect instruction format.

2. The ground controller passed a data strip containing incorrect runway information to the airport controller.

3. The ground controller did not ensure that there was a positive transfer of responsibility for control of the B727 between himself and the airport controller.

4. The crew of the B727 switched to tower frequency without being cleared by ground control.

5. The airport controller did not adequately check the position of the B727 before clearing the aircraft onto the runway.

6. The B727 crew were cleared to position on 24R and taxied to position on 24L.

7. The airport controller did not adequately check that the runway was clear before issuing the landing clearance to the Falcon 20.

Causes:
The data strip passed to the airport controller by the ground controller indicated the incorrect departure runway for the flight. The crew of the B727 taxied to position on runway 24L when cleared to position on 24R. The airport controller did not adequately check that the runway was clear before issuing the landing clearance to the Falcon.

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HAWK AIRWAYS LTD.
DE HAVILLAND DHC-2 MK1 BEAVER C-GDZC
HAWK LAKE, ONTARIO
05 JUNE 1988

REPORT NUMBER: 88-O/0203 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1330 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	891	178
LAST 90 DAYS	50	48

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	1	-

HISTORY OF THE FLIGHT:

The pilot of the float-equipped DHC-2 Beaver aircraft departed the company's base at Hawk Lake at approximately 1325 eastern daylight time (EDT) for a half hour flight to Little Missinaibi Lake, 50 nautical miles to the northeast. Following a lengthy take-off run, the aircraft climbed steeply to an altitude of several hundred feet and entered a left turn. During the turn, the angle of bank increased, the nose dropped, and the aircraft descended in a steep left-wing-low, nose-down attitude and struck the surface of the lake; the aircraft sank almost immediately in 15 feet of water. The pilot and front-seat passenger were unable to escape from the sinking aircraft and drowned. The passenger in the right rear seat was aided in his escape by another pilot who was about to take off in the opposite direction.

PERTINENT INFORMATION:

During the day, the wind velocity had increased from about 4 knots to over 11 knots at the time of the accident and had changed in direction from 270 degrees to 337 degrees. The temperature had increased from 15 degrees Celsius to 27.5 degrees Celsius. Witnesses on the lake estimated that waves six to eight inches high existed on the lake at or about the time of the accident and that the wind speed had increased during the day and become variable and gusty.

The lake, the length of which is oriented northeast/southwest, is 6,000 feet long and 2,500 feet wide. The north side of the lake is bordered by a rock bluff rising 250 feet, and, to the southwest, there are hills rising to 250 feet back from the edge of the lake.

It was calculated that the aircraft was 400 pounds below its maximum gross weight, and the centre of gravity within the prescribed limits. The take-off graph in the aircraft flight manual indicated that, under the prevailing conditions of weight and temperature, the aircraft should have become airborne after a run of about 1,100 to 1,150 feet. The pilot elected to take off in a southwesterly direction which allowed a take-off run of over 5,000 feet. The gusting variable winds generally blowing from the northwest would have resulted in a cross-wind with a slight downwind component. It was estimated from witnesses' statements that the aircraft remained on the water for almost 5,000 feet before lifting off near the southwest end of the lake.

The surviving passenger stated that, during the take-off run, he did not hear, see, or feel anything abnormal. The engine sound did not vary after take-off nor during the time the aircraft was airborne. He did not know and had not been briefed prior to take-off on how to open the rear cabin door. The original operating instructions which were stencilled to the inner door had become illegible due to age.

Examination of the wreckage did not reveal any faults in the engine, airframe, or controls which would have contributed to the accident.

ANALYSIS:

The reason for the very long take-off run could not be established. The aircraft was well below its maximum gross weight. The pilot had flown the aircraft several times earlier in the day and had apparently been satisfied with the aircraft's performance.

As the day progressed, the temperature and wind velocity had increased. The wind direction had also changed and had become gusty and variable. Turbulent air conditions were reported by other pilots operating from the lake.

Although, under the conditions prevailing at the time, the aircraft should have become airborne after a take-off run of about 1,100 to 1,150 feet, the aircraft travelled about 5,000 feet on the water before becoming airborne. At this time, the aircraft was approaching the end of the lake where the ground rose gradually to 250 feet; this possibly influenced the pilot to execute the steep climb described by the survivor. When the aircraft failed to become airborne after a reasonable distance had been covered, there was ample time and distance left in which to abort the take-off if the pilot had been unsatisfied with the aircraft's performance. It could not be established whether the aircraft stalled while in the steep climb, resulting in the left wing dropping, or whether the pilot initiated a left turn which precipitated the stall condition. In either case, it was the stall condition which led to the loss of control.

CONCLUSIONS:

Findings:
1. The take-off run was abnormally long.

2. After take-off, the aircraft entered a steep nose-high climb, entered a left turn, and stalled at an altitude of several hundred feet above the surface of the lake.

3. The stall occurred at low altitude, precluding any possibility of recovery.

4. The original operating instructions on the cabin door were illegible due to age.

Causes:
The aircraft stalled at an altitude too low to effect recovery.

SAFETY ACTION:

Action Taken:
Subsequent to this occurrence, the aircraft manufacturer issued Service Bulletin No. 2/45, dated 19 August 1988, which specifically addressed the deterioration of safety placards on DHC-2 aircraft and the required refurbishment procedures for these placards.

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WESTERN ARCTIC AIR
CESSNA SKYWAGON 207 C-GZGJ
TUKTOYAKTUK, NORTHWEST TERRITORIES
2 mi N
26 JUNE 1988

REPORT NUMBER: 88-W0121 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1530 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	423	70
LAST 90 DAYS	118	70

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

Two minutes after take-off from Tuktoyaktuk, Northwest Territories, the aircraft's engine lost all power. The pilot force-landed on the muskeg two miles north of the airport, substantially damaging the aircraft.

Prior to departure, the pilot added about 10 gallons of fuel to the left wing tank. He did not inspect the contents of the previously opened drum or use any type of filtration as he hand-pumped the fuel directly into the tank. The pilot stated that he checked the wing fuel drains afterwards and found no contamination. Examination of the aircraft at the accident site revealed a substantial quantity of water in the left fuel tank as well as water in the fuel strainer and fuel injection components. The fuel selector was in the LEFT TANK position.

The pilot did not take any precautions to prevent contamination of the aircraft fuel system while refuelling from a previously opened drum. The aircraft's engine lost all power due to water contamination of the fuel system.

CONCLUSIONS:

Findings:
1. The aircraft was refuelled with water-contaminated fuel from a previously opened drum.

2. The pilot did not filter the fuel when he refuelled the aircraft.

3. The engine lost all power due to water contamination of the fuel system.

Causes:
The pilot did not take any precautions to prevent contaminated fuel from entering the aircraft fuel system during refuelling.

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NORTHWINDS NORTHERN INCORPORATED
BRITTEN NORMAN BN2A ISLANDER C-FZUT
MUNROE LAKE, MANITOBA
27 JUNE 1988

REPORT NUMBER: 88-C0135 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0900 CDT
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,760	800
LAST 90 DAYS	204	100

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The pilot applied power for take-off. After the aircraft had travelled approximately 100 feet, the nose gear collapsed, causing substantial damage to the nose gear and aircraft nose.

The 1,000-foot-long private, dirt strip was very rough with soft areas. During the take-off roll, the nosewheel entered a soft spot, and the rearward forces were sufficient to cause the nose gear to collapse.

CONCLUSIONS:

Findings:
1. The dirt airstrip was rough with soft areas.

2. When the nosewheel contacted a soft area, there were sufficient rearward forces to cause the nose gear to collapse.

Causes:
The nose gear collapsed after contacting a soft spot in the runway.

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MINISTIC AIR LIMITED
CESSNA U206 STATIONAIR C-FCUL
WAASAGOMACH, MANITOBA
15 JULY 1988

BRIEF NUMBER: 88-C0152 (Accident)
LOCAL TIME: 1112 CDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	653	102
LAST 90 DAYS	130	102

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

While en route, the aircraft encountered rain showers which increased the humidity in the cabin, and the windshield covered with mist. The pilot turned on the air vents which partially cleared the mist. The approach to destination was made in a rain shower and calm wind conditions, making it difficult to judge height above the glassy water, and a hard landing occurred. An overshoot was carried out, and the second landing was successful. The aircraft was substantially damaged as a result of the hard landing.

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LABRADOR TRAVEL AIR LIMITED
CESSNA U206F C-GNFZ
GOOSE BAY, NEWFOUNDLAND 78 mi E
31 JULY 1988

REPORT NUMBER: 88-A0192 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1155 ADT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,400	1,400
LAST 90 DAYS	250	250

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The float-equipped aircraft departed from Port Hope Simpson, Newfoundland on a charter flight to Goose Bay, Newfoundland. The ceiling and visibility did not permit a direct flight across the Mealy Mountains, so the pilot was flying on a route which would take him around the mountains to the northeast and then along the coastline of Lake Melville to Goose Bay.

Approximately one hour after take-off, the weather deteriorated with low cloud ceilings and reduced visibility in fog and rain. The pilot flew at very low altitudes in order to maintain visual flight and eventually decided to land on a lake and await an improvement in the weather. He overflew a small lake and was turning back toward the lake when the aircraft crashed into trees on the upslope of a hill.

The pilot did not obtain a weather briefing before departure. While en route, he made contact with a helicopter pilot working in the area and was advised that the ceiling was 1,000 feet, and the visibility was six miles in fog and haze.

The area forecast warned of a cold front passing through the area, with embedded towering cumulus and cumulonimbus . Ahead of the front, the area forecast called for extensive stratus cloud with obscured ceilings of 0 to 800 feet, and visibilities varying from zero to two miles in light drizzle and fog.

The aircraft struck the trees at a descent angle of about 10 degrees and travelled 112 feet before coming to a stop. The engine was examined, and no discrepancies were found which could have precluded normal operation. Impact marks in the propeller blades, along with forward bending of the blades, indicate that the engine was developing power at impact.

The pilot continued the flight until it was necessary to fly at a dangerously low altitude to maintain visual contact with the ground. The aircraft crashed while the pilot was manoeuvring in deteriorated weather conditions. The evidence indicated that the engine was producing power at impact.

CONCLUSIONS:

Findings:
1. The pilot did not obtain weather information prior to departure.

2. The pilot continued the flight into deteriorating weather conditions and crashed while manoeuvring close to the ground in poor visibility.

3. The engine was producing power at impact.

Causes:
The pilot continued the flight into deteriorating weather.

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WAGLISLA AIR INC.
PIPER PA-31-310 NAVAJO C-GBIJ
VANCOUVER INTERNATIONAL AIRPORT, BRITISH COLUMBIA
18 AUGUST 1988

REPORT NUMBER: 88-P0179 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1535 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,000	150
LAST 90 DAYS	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	6

HISTORY OF THE FLIGHT:

The aircraft with one pilot and six passengers departed Vancouver on an instrument flight rules (IFR) flight to Bella Bella, British Columbia. Forty-five miles from Vancouver, as the aircraft reached cruising altitude of 10,000 feet, the left engine lost power. The pilot noted that the left engine's exhaust gas temperature was zero, the manifold pressure was about 12 inches, and the oil temperature and pressure were normal. The pilot did not feather the propeller or declare an emergency. He requested and received clearance to return to Vancouver. En route, he was cleared, via the Pitt localizer and Point Grey, to descend initially to 7,000 feet and subsequently to 3,000 feet. The aircraft was descending to the assigned altitudes at a rate of 500 to 800 feet per minute (fpm), at speeds between 100 and 140 knots. When the pilot attempted to level the aircraft at 3,000 feet, he discovered that the aircraft was unable to maintain level flight, and it continued to descend at 100 to 150 fpm. The pilot requested rescue assistance from the controller, just before he landed the aircraft with the gear and flaps up, on the mudflats half a mile short of runway 12 at Vancouver. There were no serious injuries.

PERTINENT INFORMATION:

At take off, the aircraft was near its maximum allowable weight of 6,500 pounds, and the centre of gravity was within the prescribed limits.

The aircraft's performance charts indicate that, with one propeller feathered and the aircraft at maximum allowable weight, the aircraft can climb to, and maintain, 14,000 feet, providing it is banked five degrees toward the operating engine and is flown at 94 knots. If the propeller is not feathered, the drag created may be as great as that of the basic airplane, and it will not be possible to maintain altitude.

When the left engine lost power, the pilot did not shut it down because he thought it was still producing some thrust. There were three suitable aerodromes nearby, two about 18 miles away and one about 28 miles away; however, the pilot decided not to attempt to land at either of these aerodromes. Since the pilot did not declare an emergency nor request assistance until just before the aircraft crashed, air traffic control (ATC) did not vector the aircraft to the Vancouver airport by the most direct route.

Examination of the left engine revealed that the fuel line to the number six cylinder had failed in fatigue. The fuel line support clamps, which were installed on all the cylinder fuel supply lines when the engine was assembled at the factory, had been removed. It could not be determined when or why the clamps had been removed. The broken fuel line was replaced, and, when the engine was test run, it performed within normal specifications. A broken line was then simulated, and the engine immediately lost power but continued to run, extremely rough, at 500 to 600 rpm. The engine backfired, and, when the throttle was retarded, the engine stopped. With the engine running in this condition, the propeller would have produced a considerable amount of drag.

ANALYSIS:

Because the fuel line to the number six cylinder was not secured, normal engine vibration caused the line to fail in fatigue, resulting in the loss of engine power. Because the pilot thought that the left engine was producing some thrust, he did not feather the left propeller. The drag produced by the windmilling left propeller was such that level flight could not be maintained with the remaining engine. Had the pilot maintained the recommended airspeed of 94 knots to minimize the rate of descent and feathered the left propeller to minimize drag, the aircraft could have safely reached the Vancouver airport. The pilot's decision to return to Vancouver meant that he passed up the opportunity to land at nearer airports.

CONCLUSIONS:

Findings:
1. The fuel nozzle lines were not clamped as required by the manufacturer.

2. The fuel nozzle line to the number six cylinder on the left engine failed in fatigue caused by normal engine vibration, and the engine lost power.

3. The pilot did not feather the left propeller, and the aircraft was unable to maintain level flight.

4. Because the pilot did not declare an emergency, ATC did not vector the aircraft to Vancouver by the most direct route.

5. The pilot did not maintain the best rate of climb airspeed to minimize altitude loss.

6. The pilot flew past nearby airports that were suitable for landing.

Causes:
A fuel nozzle line in the left engine broke in fatigue because it was not properly secured. The pilot did not feather the left propeller, nor did he maintain the single engine best rate of climb airspeed.

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CALM AIR INTERNATIONAL LTD.
PIPER PA-31-350 CHIEFTAIN C-GURM
THOMPSON, MANITOBA
21 AUGUST 1988

REPORT NUMBER: 88-C0180 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0030 CDT
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,360	603
LAST 90 DAYS	259	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	5

SUMMARY REPORT:

The aircraft was pushed from the hangar to the passenger loading area, and the passengers boarded. The pilot started the engines and completed the necessary preparations for flight. As the pilot was about to taxi the aircraft, the nose landing gear collapsed. The aircraft was shut down, and the passengers disembarked without incident.

The aircraft was placed on jacks, and the landing gear cycled normally. The rigging was checked and found to be within tolerances. There was no dirt in any of the mechanisms that could have caused the nose landing gear to retract. The aircraft was returned to service, and the problem has not recurred.

CONCLUSIONS:

Findings:

1. The nose landing gear collapsed while the aircraft was stationary.

2. The landing gear system functioned normally during retraction tests.

Causes:

The nosewheel retracted for undetermined reasons.

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AQUILA AIR LTD.
PIPER PA-23-250 AZTEC C-FNVW
QUALICUM, BRITISH COLUMBIA
30 AUGUST 1988

REPORT NUMBER: 88-P0200 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1220 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	895	397
LAST 90 DAYS	280	232

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	5

HISTORY OF THE FLIGHT:

The pilot and five passengers were to fly to Vancouver from Qualicum, British Columbia. The aircraft was just lifting off with a speed of about 95 mph, when the passenger seated beside the cabin entrance door reported that the door had opened. The pilot rejected the take-off. The aircraft was a few feet in the air, and, when it touched down, there was about 1,000 feet of runway remaining. The aircraft ran off the end of the runway, down an embankment, and across a road. It came to a stop in a field, 330 feet off the landing surface. The occupants were uninjured and were able to exit the aircraft without difficulty.

PERTINENT INFORMATION:

After the passengers were on board, the pilot closed and locked the door, started the engines, and taxied to the runway. While taxiing, he completed the pre-take-off checks and confirmed that the door was secure. The passenger seated by the door said that he too checked the door handle to ensure that the door was locked.

The pilot was licensed and qualified on the aircraft type. The accident flight was to have been his fourth flight of the day.

The runway at Qualicum is 2,900 feet long and 75 feet wide. The asphalt surface was free from contamination, and the braking action was good. There was no cloud, the wind was from 310 degrees at 5 to 10 knots, and the temperature was 24 degrees Celsius. The aircraft owner's manual indicates that a 900-foot ground run is required to stop the aircraft if the landing speed is 72 mph and landing flaps are used. The manual does not provide accelerate/stop distances for take-off computations. The aircraft's flaps were up for take-off.

The aircraft owner's manual directs the pilot to reduce the airspeed to 90 mph before attempting to close an open door in flight. If the door opens on take-off, the procedure to be used is at the pilot's discretion.

The aircraft had been serviced in accordance with existing directives, and there were no outstanding defects recorded in the maintenance log that were applicable to the accident. Two airframe log entries refer to the door – on 21 January 1988, the door upper lock was repaired, and, on 28 August 1988, the upper door latch was adjusted.

The door is latched closed by rotating the door handle to the closed position. If the door latch assembly is properly installed and adjusted, there is a distinct snap-through action of the door handle as the main bellcrank passes the overcentre position. To check for proper snap-through action, five to six pounds of force should be required to rotate the door handle from the properly closed to the open position. When the bellcrank is in the overcentre and locked position, a locking trim knob, similar to the locking knob on a car door, can be pushed down thereby restricting the movement of the latching tube. Restricting the movement of the tube prevents the bellcrank from rotating, or being *rotated, to the* open *position.*

The door was disassembled and inspected. A component of the door latch assembly (PN 18057-04) was found to have been installed upside-down which effectively disabled the overcentre locking feature of the bellcrank assembly. Also, the latching tube was badly worn where it had been in contact with the locking trim. Because the door latch assembly was incorrectly installed, the door handle was only held in the closed position by the locking trim restricting the movement of the latching tube. There would be no snap-through action of the door handle when it was rotated to the closed position, and, if the latching tube was permitted to move, the bellcrank would be free to rotate to the open position.

ANALYSIS:

The pilot verified that the door was closed on two occasions. However, if the passenger pulled on the door handle to verify that the door was locked, the locking trim may have slipped past the badly worn latching tube, or the locking mechanism may have been so badly worn that it finally could not prevent the latching tube from moving. In either case, the bellcrank would be allowed to rotate, effectively unlocking the door, and the door handle would be free to rotate open. Air pressure differential, as the airspeed increased, then caused the door to open.

When the door opened, the pilot was required to make an immediate decision to either reject or continue the take-off. He did not know the flight characteristics of the aircraft with the door open, and he did not know if the passenger would be able to hold the door closed. He thought that he could stop the aircraft on the runway, so he decided to reject the take-off rather than to chance losing control of the aircraft after it was airborne. However, because the aircraft was travelling about 20 mph faster than the published 72 mph landing speed and the wing flaps were up, the stopping distance required was much longer than 900 feet. It was not possible for the pilot to stop the aircraft on the 1,000 feet of remaining runway.

CONCLUSIONS:

Findings:

1. The aircraft's cabin entrance door latch assembly was incorrectly installed.

2. The cabin entrance door opened at lift-off.

3. There was insufficient stopping distance available for the pilot to stop the aircraft on the runway after he rejected the take-off.

Causes:

The aircraft's cabin entrance door latch assembly was incorrectly installed and badly worn. There was insufficient stopping distance available for the rejected take-off.

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FLY WEST AIR LTD.
CESSNA A185E SKYWAGON C-GWIM
DEASE LAKE, BRITISH COLUMBIA
28 SEPTEMBER 1988

BRIEF NUMBER: 88-P0223 (Accident)
LOCAL TIME: 1255 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,927	855
LAST 90 DAYS	300	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

In preparation for landing, the pilot overflew the aerodrome and noted that the wind was from 90 degrees to the left of the runway at 5 to 10 knots. The aircraft bounced on landing, and, when the tail wheel settled to the ground after the second touchdown, the aircraft veered to the left. The pilot applied full right rudder and brake; however, the aircraft ground looped and ran off the runway. The right landing gear collapsed, and the aircraft came to rest on its belly and right wing.

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DAUPHIN AIR SERVICES LTD.
CESSNA 172M SKYHAWK C-GECA
GRACE LAKE, MANITOBA
05 MARCH 1988

BRIEF NUMBER: 88-C0049 (Accident)
LOCAL TIME: 1300 CST
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	44	44
LAST 90 DAYS	44	44

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot landed on a 3,300-foot gravel runway that had snow and ice patches on it. After landing, the pilot lost directional control when the aircraft skidded on icy patches. The aircraft left the runway, struck a snowbank, and overturned.

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CENTRE QUÉBÉCOIS DE FORMATION AÉRONAUTIQUE
BEECH C23 (SUNDOWNER) C-GTYN
SAINT-HONORE AIRPORT, QUÉBEC
05 APRIL 1988

REPORT NUMBER: 88-Q0065 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1504 EDT
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	70	70
LAST 90 DAYS	10	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The student pilot was returning from a solo flight in the training area after taking off from runway 18. During the initial contact, the tower controller informed the pilot that runway 12 was in service and that the wind was from 150 to 160 degrees at 15 gusting to 20 knots. The final approach was made with 30 degrees of flap selected, at 1500 rpm, and at an approach speed of about 70 to 75 knots. The aircraft was rounding out at an altitude of 30 to 40 feet, when it encountered a 20-knot gust of wind, and the aircraft's rate of descent increased. The pilot applied power, but the aircraft landed hard on the runway and veered to the left. The left wheel supports and nosewheel supports failed, and the aircraft slid to a stop. The student pilot was uninjured.

The student pilot had been authorized by his instructor to perform this flight but was instructed to keep within the following skill levels for landings: maximum crosswind of five knots and maximum gusting of five knots. According to the instructor, these limits provided an adequate safety margin as the student pilot had recently practised touch-and-go landings under dual control, in conditions exceeding these limits.

During the final approach, the rate of descent increased when the aircraft encountered a gust of wind. The student pilot, who was operating close to the imposed limits, did not increase the power sufficiently to correct the situation. The aircraft landed hard, and the left gear and nose gear collapsed.

CONCLUSIONS:

Findings:
1. The wind was variable and gusting at speeds close to the maximum limit authorized for the student pilot.

2. When the aircraft encountered a gust of wind, the student pilot did not compensate sufficiently to correct the high rate of descent, and the aircraft landed hard.

Causes:
During the landing, the student pilot did not compensate sufficiently to correct the high rate of sink which occurred when the aircraft encountered a gust of wind in excess of the limit authorized for the student pilot.

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AÉROCLUB DE VALCOURT INC.
CESSNA 150K C-FYXE
VALCOURT, QUÉBEC
10 APRIL 1988

BRIEF NUMBER: 88-Q0072 (Accident)
LOCAL TIME: 1505 EDT
OPERATION: Flying Club Training
DAMAGE: Minor
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	92	12
LAST 90 DAYS	12	12

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The student pilot was on his third solo flight. While attempting a cross-wind landing, the pilot lost control of the aircraft, and it turned to the right. The aircraft continued off the runway, and the nosewheel collapsed. The pilot was not injured.

The 75-foot-wide runway was oriented in a northeasterly direction. The wind was blowing from 270 degrees magnetic at 15 to 20 mph. The approach was flown at a speed of 70 mph with 20 degrees of flap selected.

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CENTRE QUÉBÉCOIS DE FORMATION AÉRONAUTIQUE
(CÉGEP DE CHICOUTIMI)
BEECH 23 MUSKETEER C-FEQE
ST-HONORÉ AIRPORT, QUÉBEC
20 APRIL 1988

REPORT NUMBER: 88-Q0077 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1045 EST
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	226	150
LAST 90 DAYS	46	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

Following a 90-minute training flight in the training area, the student pilot returned to the longest of the three runways at the St-Honoré Airport to practise touch-and-go landings. During the second climb, the engine (Lycoming 0360) lost power, and the student pilot, who was flying solo, was forced to land off the runway. The wings damaged several approach lights, and the aircraft was substantially damaged. The student pilot was not injured.

PERTINENT INFORMATION:

The student pilot had been authorized by her instructor to do two hours of flying training. She did the pre-flight inspection and topped up the engine oil, and this caused some delay. She estimated that the aircraft had enough fuel on board to complete the flight, and she felt it was not necessary to add more. According to school regulations, each of the aircraft's two tanks must contain at least 20 U.S. gallons of fuel prior to a flying exercise.

Students at the Centre québécois de formation aéronautique fly Beech 19 and Beech 23 aircraft. The Beech 19 with a 160 horsepower engine consumes between 7.8 and 8.2 U.S. gallons per hour, and a Beech 23 with a 180 horsepower engine consumes between 9 and 9.8 U.S. gallons per hour. The student pilot was planning to fly a Beech 23; however, when she estimated the fuel consumption, she based the consumption rate of the Beech 23 on that of a Beech 19 and decided it was not necessary to add more fuel. On the previous day, another student pilot had flown the accident aircraft for 90 minutes after ensuring that it contained the required 40 U.S. gallons. As that flight had consumed between 13 and 14 gallons, the two tanks still contained a total of about 26 gallons.

The fuel tanks were not damaged in the accident. When they were drained after the forced landing, the right tank, the one used by the student pilot on her training flight, contained about 1/10 of a gallon of gas and the left tank contained 14 gallons. Based on the aircraft's hourly rate of consumption, it was determined that, before take-off, the right tank also contained 14 gallons of fuel which was consumed during the flight completed just before the accident.

The student pilot said she was not sure whether she had changed the position of the fuel tank selector before her first landing. She also said that she had not checked the position of the selector or the reading on the two fuel gauges.

ANALYSIS:

Having lost time checking the engine oil, the student pilot hastily checked the fuel level in the two tanks; however, the hourly rate of consumption she estimated was less than that of the aircraft she was about to fly. Therefore, she did not refuel the aircraft to the required minimum of 20 U.S. gallons per tank. She thought she still had 17 to 18 gallons of fuel in each tank, when, in fact, she had only 14 gallons, the quantity required for the flight she had completed. Following the forced landing, it was found that the right tank, which the student pilot had used, contained 1/10 of a gallon of gas, while the left tank contained 14 gallons. The engine lost power because of fuel exhaustion in the tank selected.

CONCLUSIONS:

Findings:

1. The student pilot did not think it was necessary to refuel the aircraft to the required minimum of 20 gallons per tank, because she believed that both tanks still contained 17 to 18 gallons of fuel; the tanks actually contained no more than 14 gallons.

2. The fuel consumption estimated by the student pilot was less than that of the aircraft she was to use.

3. The student pilot did not check the position of the fuel tank selector or the fuel gauge readings.

4. When the tanks were drained, it was found that the right tank contained 1/10 of a gallon of fuel, a quantity that is unusable on this model, and the left tank contained 14 gallons.

Causes:
The student pilot did not ensure proper fuel management for the flight.

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PIPER PA-24 COMANCHE CF-EJP
CHILLIWACK AIRPORT, BRITISH COLUMBIA
22 MAY 1988

REPORT NUMBER: 88-P0098 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1500 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	350	14
LAST 90 DAYS	30	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger took off from Merritt, British Columbia for a 50-minute flight to Abbotsford. About 30 miles from destination, while the aircraft was descending from 6,500 feet to 3,000 feet, the engine began to surge. The pilot selected carburettor heat and switched from the left to the right fuel tank. Since the engine continued to surge, the pilot decided to land at Chilliwack Airport, five miles away. On short final for runway 24, the pilot lowered the landing gear, and the aircraft's rate of descent increased. The pilot realized that he could not reach the runway, and, because there was a deep ditch 500 feet from the threshold of the runway, he left the gear down and landed in a soft ploughed field 1,000 feet short of the runway. On landing, the landing gear was torn off, substantially damaging the aircraft.

The Aircraft Owner's Handbook specifies a full fuel endurance time of 4.3 hours with 75 per cent power at sea level. At the time of the occurrence, the engine had run for 3.4 hours since the aircraft had last been refuelled to capacity.

Following aircraft recovery, the fuel tanks were drained. The left fuel tank contained 11.2 U.S. gallons, and the right fuel tank was empty.

The fuel system in the aircraft is designed so that fuel is drawn from the inboard aft corner of each fuel tank. After the accident, the aircraft was put in various attitudes on jacks, and it was found that nose-down angles in excess of 12.5 degrees coupled with an angle of bank in excess of three degrees would uncover the fuel port in the tank in the lower wing when the tank contained 11.2 U.S. gallons or less.

The two cockpit fuel gauges were placarded "Fuel gauges inaccurate. Please dip fuel tank prior to flight." It was confirmed that both fuel gauges were inaccurate.

The fuel pressure gauge indicated three pounds per square inch (psi), that is, in the green, at all times whether or not fuel pressure was being developed.

There were two batteries in parallel in the aft battery compartment area. The equipment list and weight and balance did not record this extra battery installation.

When the aircraft descended in a slightly left-wing-low attitude, with the left front tank selected, the fuel moved to the front outboard corner of the left tank and uncovered the fuel port; this allowed air to enter the engine fuel intake line and caused the engine to surge due to fuel starvation. When the pilot then selected the right tank which contained only a small amount of fuel, the engine continued to surge as air mixed with the fuel. With an unserviceable fuel pressure gauge and unreliable fuel gauges, the pilot was not sure that his problem was fuel related, and he decided to land at the nearest airport.

On short final when the pilot selected the gear down, the extra drag of the landing gear increased the aircraft's rate of descent, and, as the surging engine was producing insufficient power to enable the aircraft to reach the runway, the aircraft landed short of the runway.

CONCLUSIONS:

Findings:

1. While the aircraft was in a nose-down, left-wing-low attitude, the 11.2 gallons in the selected left tank became unusable, and the engine surged.

2. The pilot selected the right fuel tank which was nearly empty, and the engine continued to surge from fuel starvation.

3. The fuel gauges were unreliable.

4. The fuel pressure gauge was unserviceable.

5. When the landing gear was selected down, the extra drag created a higher rate of descent, and the aircraft landed short of the runway.

6. An extra battery was installed without a weight and balance amendment.

Causes:
Fuel management was inadequate, and the engine lost power because of fuel starvation.

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SKYWAY AIR SERVICES LTD.
CESSNA 180G SKYWAGON C-FRLI
FORT LANGLEY, BRITISH COLUMBIA
31 MAY 1988

REPORT NUMBER: 88-P0109 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1530 PDT
OPERATION: Specialty Training
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	206	5
LAST 90 DAYS	120	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was practising touch-and-go landings in the float-equipped Cessna 180 to fulfil the landing requirements for a float endorsement. There was a light cross-wind from the left. Following a bounce on landing, the pilot reduced power and the right wing dropped and dug into the water. The aircraft nosed into the water and then settled back onto the floats. The outboard six feet of the right wing and the right aileron were deformed and twisted, but the pilot was not injured.

There was broken cloud, and the visibility was eight miles. The wind was from the southwest at six to eight knots with gusts to 10 knots.

The Fort Langley float base is situated on the Fraser River which is oriented east-west at that location, and the landings were made to the west. The cross-wind condition on landing was therefore 45 degrees from the left.

The pilot applied left aileron when the right wing dropped, but he did not want to over-correct when close to the water.

The aircraft was equipped with a Robertson STOL (short take-off and landing) kit, which increased the wing area and decreased the landing speed; the size of the ailerons was the same as on the standard aircraft. Pilots who have flown this aircraft report that, because the size of the wing is increased but not the size of the ailerons, greater aileron control input is required to bank the aircraft fitted with the STOL kit than the standard aircraft, particularly at lower speeds when the effectiveness of the ailerons is reduced.

When the pilot reduced power after the bounce, the airspeed decreased, resulting in a further reduction in aileron effectiveness. When the wing dropped, the pilot did not use a large enough aileron control movement to correct the low-wing condition, and he lost control of the aircraft.

CONCLUSIONS:

Findings:

1. The pilot was inexperienced on type.

2. The landing was made in a cross-wind.

3. The pilot lost control of the aircraft.

Causes:

The pilot did not use sufficient aileron control movement to control the aircraft in the cross-wind.

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CESSNA 152II C-GFHK
GRANITE LAKE, ONTARIO
01 JUNE 1988

BRIEF NUMBER: 88-C0097 (Accident)
LOCAL TIME: 1840 CDT
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	790	200
LAST 90 DAYS	240	70

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was flying from Atikokan to Thunder Bay, Ontario, when he encountered deteriorating weather. Because there were clouds and fog in all directions, he made a precautionary landing on a logging road. During the landing roll, the right wing struck a tree.

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CESSNA 152 C-GBJD
GRAND VALLEY, ONTARIO
11 JUNE 1988

BRIEF NUMBER: 88-O/0214 (Accident)
LOCAL TIME: 0730 EDT
OPERATION: Flying Club Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	800
LAST 90 DAYS	271	200

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The aircraft touched down approximately 1,500 to 2,000 feet from the threshold of the 3,000-foot runway. The runway was grass covered, wet, and had a downslope in the direction of landing. The brakes were applied but were ineffective; the aircraft ran off the end of the runway and struck a ditch.

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INTERLAKE AVIATION CO. LTD.
CESSNA 150J C-GFWV
WINNIPEG BEACH, MANITOBA 4mi W
16 JUNE 1988

REPORT NUMBER: 88-C0117 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2120 CDT
OPERATION: Flying Club Recreational
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,730	500
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was flying a recreational flight in the local area. After approximately one hour of flight, the pilot flew to a farm strip to practise circuits. He completed three circuits but did not touch down because he was not sure of the surface condition. During the overshoot from the final circuit, the aircraft flew into trees off the end of the runway. The pilot, who was wearing a shoulder harness, received minor injuries,; the aircraft was extensively damaged.

The pilot reported that the aircraft operated properly, and the investigation revealed no evidence of a pre-impact malfunction. The weather was excellent, with high scattered clouds and light winds.

The airstrip was 2,500 feet in length, oriented in a north/south direction, with 30- to 40-foot-high trees located 100 feet from the south end of the strip. When the aircraft was approximately 10 feet above the ground, it entered the trees and travelled 110 feet before coming to rest in the inverted position.

The pilot had risen early and had arrived at work 15 hours prior to the accident. He normally worked long hours and had been under considerable work-related and personal stress.

It is likely that the pilot was fatigued and preoccupied because he was working long hours and was functioning under stressful conditions. This resulted in inattention, and the pilot inadvertently flew the aircraft into the trees off the end of the airstrip. The fact that the pilot was wearing a shoulder harness probably prevented serious injury.

CONCLUSIONS:

Findings:
1. Following an overshoot, the pilot inadvertently flew the aircraft into trees off the end of the airstrip.

2. The pilot was probably fatigued and preoccupied as a result of stress and long work hours.

3. The pilot was wearing a shoulder harness, which probably prevented serious injury.

Causes:
Following an overshoot, the fatigued and preoccupied pilot inadvertently flew the aircraft into trees.

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INTERLAKE AVIATION LIMITED
CESSNA 150L C-GVAH
GIMLI, MANITOBA
04 JULY 1988

BRIEF NUMBER: 88-C0142 (Accident)
LOCAL TIME: 1350 CDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,145	400
LAST 90 DAYS	195	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The student had just completed a normal landing, and the instructor took control to demonstrate a soft field take-off. She raised the flaps to ten degrees and advanced the throttle to the full-open position. Just as the aircraft became airborne, a gust of wind caused the left wing to drop. The aircraft stalled and descended rapidly. The left wing and nose struck the ground, and the nose gear fractured.

The student and instructor were wearing their shoulder harness which probably prevented serious injuries.

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TRINITY WESTERN UNIVERSITY
CESSNA 172M SKYHAWK C-GCOG
LANGLEY AIRPORT, BRITISH COLUMBIA
28 JULY 1988

REPORT NUMBER: 88-P0159 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1343 PDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	23	23
LAST 90 DAYS	23	23

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The student pilot, who had begun his flying training three weeks earlier, was on a supervised solo flight. He planned to practise a soft-field landing followed by a go-around on the 2,100-foot paved runway. When he flared for landing, the aircraft ballooned and landed long. The pilot selected flaps up, put the carburettor heat control to cold, and applied full power after the flaps retracted. As the aircraft approached flying speed, the pilot realized that there was not enough runway remaining, and he rejected the take-off. The aircraft overran the runway and struck the airport perimeter fence 150 feet beyond.

The weather was good, and the wind was at five knots, favouring the landing runway.

The aircraft was operating properly at the time of the occurrence.

It is not known how far down the runway the aircraft landed; however, had the aircraft touched down in the normal landing area, there would have been sufficient runway available for the student to complete the planned exercise. The combination of the long landing and the delay in applying power while waiting for the flaps to retract resulted in there being less runway available than required for take-off. The pilot rejected the take-off too late to stop the aircraft on the runway.

CONCLUSIONS:

Findings:

1. The pilot landed the aircraft long.

2. The pilot was slow in applying power for the go-around.

3. The pilot rejected the take-off too late to prevent the aircraft from overrunning the runway.

4. The aircraft struck a fence.

Causes:

The aircraft was landed long, and the take off was rejected too late for the aircraft to stop on the runway.

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SKY WINGS AVIATION LTD.
CESSNA 182RG SKYLANE C-GGHM
ASSINIBOIA AIRPORT, SASKATCHEWAN
29 JULY 1988

BRIEF NUMBER: 88-C0162 (Accident)
LOCAL TIME: 2035 CST
OPERATION: Flying Club Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	190	18
LAST 90 DAYS	23	18

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

After touchdown, the aircraft bounced slightly, then touched down again. The pilot noticed a nosewheel vibration and pulled back on the control column. The nose of the aircraft rose abruptly, and the pilot countered by pushing the control column forward. The nosewheel struck the runway, and the nose landing gear collapsed. The vibration may have been due to the nosewheel contacting an area of breakup in the runway.

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CENTENNIAL FLIGHT CENTRE
CESSNA A150M AEROBAT C-GOLY
JASPER/HINTON, ALBERTA 9 mi SW
14 AUGUST 1988

REPORT NUMBER: 88-W0184 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1645 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	113	4
LAST 90 DAYS	11	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The aircraft departed from the Jasper Park Aerodrome and 15 minutes later arrived at the Jasper/Hinton Airport. As the aircraft touched down, the pilot noticed that the wind had shifted and, although he was not experiencing any difficulty controlling the aircraft, he initiated a go-around. While climbing, the engine lost all power, and the pilot force-landed the aircraft on a narrow rural road. As the aircraft touched down, the right wing struck trees along the roadside, causing the aircraft to yaw to the right and nose over.

The flight originated from Edmonton with full fuel and proceeded to Jasper. Before leaving Jasper, the pilot visually checked the fuel remaining and estimated that he had more than one hour of fuel; he did not use a dipstick. The left fuel gauge read one-eighth and the right indicated empty, but the pilot disregarded these readings as inaccurate. Fuel was not available at the Jasper Park Aerodrome.

The pilot had one hour on this aircraft type prior to this day and was not familiar with its operation or performance. He did not consult the pilot operating handbook for recommended power settings and fuel consumption. Instead, he selected higher than normal power settings, trying to achieve the performance he was more familiar with in Cessna 172 aircraft.

Examination of the aircraft at the accident site revealed that one U.S. gallon of fuel remained in the aircraft. There was no evidence of pre-crash leakage, although a small quantity did drain through the vent while the aircraft was nosed over. Fuel was added to the aircraft, and the engine was started without difficulty. The engine and controls operated normally. The pilot operating handbook indicates that this aircraft has 3.5 U.S. gallons of unusable fuel.

The total flight time before the loss of power was 3.5 hours and included three take-offs and climbs to as high as 8,000 feet above sea level.

The pilot disregarded the fuel gauge indications and inaccurately estimated the fuel quantity by looking into the tanks. The engine lost all power because of fuel exhaustion.

CONCLUSIONS:

Findings:
1. The pilot disregarded the fuel gauge indications and inaccurately estimated the fuel quantity prior to flight.

2. The pilot was not familiar with the operation or performance of the aircraft.

3. The engine lost all power because of fuel exhaustion.

Causes:
The pilot did not accurately determine the fuel quantity in the aircraft. The engine lost all power because of fuel exhaustion.

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TORONTO AIRWAYS LTD.
CESSNA 152 C-GOEF
TORONTO/BUTTONVILLE AIRPORT, ONTARIO
16 AUGUST 1988

BRIEF NUMBER: 88-O/0324 (Accident)
LOCAL TIME: 1535 EDT
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	48	48
LAST 90 DAYS	27	27

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

During the initial climb, the student pilot diverted her attention to trimming the aircraft for climb, and it settled back onto the runway. After the initial contact with the runway, the aircraft began to porpoise, causing the nosewheel oleo to fail, and the aircraft came to rest on the runway, on its nose.

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WHITE'S AIRCRAFT SERVICES
CESSNA 152 C-GPOO
ST-ANDRÉ AVELLIN AIRPORT, QUÉBEC
19 AUGUST 1988

BRIEF NUMBER: 88-Q0235 (Accident)
LOCAL TIME: 0100 EDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	530	249
LAST 90 DAYS	271	217

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft was returning from a night cross-country training flight, and the instructor decided that the landing would be made without the use of the aircraft's landing lights. The runway was illuminated with flare pots only. On final approach, the crew heard a series of thumps and cracking noises. The instructor took control of the aircraft and landed safely on the runway.

The aircraft had flown through 50-foot-high trees on terrain that was 150 feet higher than the airport elevation. the student was flying the approach and maintaining height with reference to the altimeter, and neither pilot saw the trees.

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CHILLIWACK FLYING CLUB
CESSNA 172 SKYHAWK C-GEJV
CHILLIWACK AIRPORT, BRITISH COLUMBIA
22 AUGUST 1988

REPORT NUMBER: 88-P0188 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1530 PDT
OPERATION: Flying Club Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	70	65
LAST 90 DAYS	7	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The pilot and three passengers on board had just lifted off from the runway when the aircraft began to roll to the left. The pilot applied right aileron and then applied right rudder, which levelled the wings but did not stop the aircraft from drifting to the left. The pilot decided to land the aircraft, and he pushed forward on the controls. The aircraft touched down 900 feet from the runway threshold, in grass 10 feet to the left of the runway. The pilot did not reduce the engine power, and the aircraft continued across the ground, swinging to the left until it struck a deep ditch. The aircraft was substantially damaged.

The aircraft's weight was 28 pounds below the maximum allowable gross weight, and the centre of gravity (C of G) was within the prescribed limits. However, because the two heaviest passengers were in the rear seat, the aircraft's C of G was near the aft limits.

At the time of the occurrence, the sky was clear and visibility was unlimited. The wind was from 250 degrees magnetic at seven knots and the temperature was 25 degrees Celsius.

The performance charts for the aircraft specify that aircraft required a take-off roll of 920 feet under the existing conditions.

The pilot reported that he rotated the aircraft at 65 knots. The aircraft took off in considerably less distance than that indicated by the performance charts; therefore, the take-off speed used must have been lower than the recommended take-off speed of 60 knots, resulting in the aircraft becoming airborne at too low an airspeed to maintain flight. It is probable that the aft C of G combined with the pilot's inexperience caused the aircraft to rotate and become airborne prematurely. The inadequate airspeed on take-off resulted in the pilot having problems controlling the aircraft and eventually losing control.

CONCLUSIONS:

Findings:

1. The aircraft became prematurely airborne.

2. The C of G was near the aft limit.

3. The pilot had limited experience.

4. The pilot did not reduce engine power after touchdown.

5. The pilot lost control of the aircraft.

Causes:
The aircraft became airborne prematurely, and the pilot lost control.

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PIPER PA-28 CHEROKEE C-GQFN
KILLARNEY, MANITOBA 9 mi S
25 SEPTEMBER 1988

BRIEF NUMBER: 88-C0197 (Accident)
LOCAL TIME: 1630 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	83	83
LAST 90 DAYS	1	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot was taking off from a rolling, stubble field approximately 2,600 feet in length. The field was soft, the aircraft was at gross weight, and the pilot did not use flaps. The aircraft became airborne near the end of the field, and the pilot pulled back on the control column to clear a fence. The stabilator struck the fence, and the aircraft settled onto an adjacent field.

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GOGAL AIR SERVICE
CESSNA 185F SKYWAGON C-GEUU
NORTH STAR LAKE, MANITOBA
29 FEBRUARY 1988

BRIEF NUMBER: 88-C0043 (Accident)
LOCAL TIME: 0915 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,145	2,122
LAST 90 DAYS	80	80

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot carried out a normal ski landing on a rough snow- covered lake. On touchdown, the left ski came into contact with a frozen drift with sufficient force to fracture the left gearbox, allowing the gear to collapse. The propeller struck the left ski as it moved forward into the propeller arc. The aircraft then slid to a stop on its left side which resulted in wing and elevator damage. A cold night had caused the snow to freeze after two days of warm temperatures.

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DAWN AIR LIMITED
DHC-3 OTTER C-FYLZ
UNNAMED LAKE, SASKATCHEWAN
02 MARCH 1988

REPORT NUMBER: 88-C0046 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0800 CST
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,447	225
LAST 90 DAYS	250	225

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

On the return leg of the first flight of the day, the pilot decided to check out a lake he intended to use later in the day. After an aerial inspection circuit, he landed his ski/wheel-equipped aircraft on what appeared to be a suitable area. On the landing roll, as the aircraft travelled down a snow drift, the right ski sank in soft snow and then caught on a hard drift. The aircraft nosed down, the right landing gear failed, and the right wing was damaged.

In the area selected for landing, soft snow covered the hard snow drifts, and, as a result, the hard drifts were not visible from the air.

CONCLUSIONS:

Findings:
1. The right ski caught on a hard snow drift that could not be seen because it was covered by soft snow.

2. The pilot had completed an aerial inspection to pick out the most suitable area for landing.

Causes:
The right ski struck an obscured hard snow drift on landing.

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AIR BGM INC.
CESSNA 206F C-GAHU
LAC CATHERINE, QUÉBEC
19 MARCH 1988

REPORT NUMBER: 88 Q0046 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0920 EST
OPERATION: Charter
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	11,000	1,000
LAST 90 DAYS	300	100

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS		1	1

SUMMARY REPORT:

The pilot of the ski-equipped aircraft was on a visual flight rules (VFR) flight from La Tuque, Québec to Lac Catherine, Québec, to transport two passengers to their cottage. The pilot-in-command was accompanied by another company pilot. The pilot landed on partially melted snow and brought the aircraft to a stop about 100 feet from the cottage. The passenger disembarked from the left side of the aircraft to indicate to the pilot the parking spot he had prepared for the aircraft. When the co-pilot turned off the magnetos, the pilot-in-command, who was busy stowing his navigation charts, noticed the passenger between the wing strut and the propeller. He closed the throttle immediately, but, before the engine stopped, the passenger's right arm and left hand were severely injured by the propeller. The aircraft was airworthy, and the weather was not a factor in the accident.

The pilot-in-command was qualified for the flight. While undergoing flight tests a short time before the incident, the pilot was told by Transport Canada inspectors on two occasions that he should give safety briefings to his passengers before every flight. The injured passenger did not fly regularly; he had stated, however, that he had travelled in a floatplane a few times, and the pilot assumed that he was used to flying. The passengers did not receive a safety briefing prior to the flight. The pilot allowed one passenger to disembark without warning him of the danger of getting out of an aircraft while the engine is running. The pilot was busy stowing his charts and failed to see the passenger walk under the wing strut. It was not until the co-pilot turned off the magnetos that the pilot-in-command saw the passenger, and, although he closed the throttle immediately, the passenger moved into the propeller.

Because the passenger had stated that he had flown before, the pilot-in-command thought he was well aware of the safety precautions and did not give a pre-flight safety briefing to advise him of the potential dangers. The pilot-in-command allowed the passenger to disembark while the engine was still running; he was busy stowing his charts, and did not see the passenger walking toward the propeller until it was too late.

CONCLUSIONS:

Findings:
1. The pilot allowed a passenger to disembark while the engine was running and did not watch where the passenger was going.

2. The passenger did not see the propeller and it struck him.

3. The passenger, who was not a frequent air traveller, was not given a pre-flight safety briefing.

Causes:
The passenger was not advised of the potential risks of being around aircraft and was struck by the propeller.

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AIR INUIT (1985) LTD.
HAWKER SIDDELEY HS-748 C-GCUK
LA GRANDE RIVIÈRE AIRPORT, QUÉBEC
20 MARCH 1988

REPORT NUMBER: 88-Q0047 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1050 EST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	5,800	1,470	7,500	550
LAST 90 DAYS	180	180	180	180

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	4
PASSENGERS			

HISTORY OF THE FLIGHT:

The co-pilot completed the walkaround inspection of the aircraft and removed the safety devices from the landing gear. He then entered the aircraft, where the pilot was carrying out the before-start check. A few seconds after the first engine (the right engine) was started, a warning device sounded. Thinking that the warning had sounded because of a malfunction in the cabin door microswitch, the pilot continued the starting procedure. When he noticed that the landing gear indicator lights were red, he closed the fuel shutoff valve to stop the engine. The nose gear retracted, and the aircraft fell onto its nose. Because of the weight of the aircraft, however, the main landing gear did not retract.

PERTINENT INFORMATION:

The pilot stated that, while the usual before-start checks were being carried out, the GEAR DOWN AND LOCKED indicator lights were on and the gear control lever was in the GEAR DOWN position. On this type of aircraft, the three GEAR DOWN AND LOCKED indicator lights are essentially controlled by three microswitches mounted on each gear-down lock. They can indicate GEAR DOWN AND LOCKED even if the control lever is not in the GEAR DOWN position, provided that the hydraulic system is not under pressure when GEAR DOWN is selected. It is only when the throttle levers are placed at an angle greater than 34 degrees that the warning device alerts the crew to a problem with the landing gear system.

The day before the accident, the aircraft had completed a four-hour return trip between LG-2 and Val d'Or, Québec, but no deficiencies were recorded in the aircraft log. During the evening, the maintenance crew performed the daily inspection and checked the emergency landing gear extension system. At that time, the control lever was in the GEAR UP position; the procedure does not require that the lever be activated.

The emergency gear extension system is checked every 250 hours. This procedure includes several steps, the last of which is re-pressurization of the hydraulic system. The maintenance crew did not complete this step. The aircraft remained on the runway apron all night, held in place only by wheel chocks; the brakes were not applied.

ANALYSIS:

When the pilot moved the right engine throttle forward, the landing gear warning sounded and the lights changed from green to red. This can occur only if the gear control lever is not in the GEAR DOWN position.

The maintenance crew placed the control lever in the GEAR UP position because they misinterpreted the procedure for checking the emergency gear extension system. Even had the hydraulic system had been re-pressurized after the check, as per the procedure, the nose landing gear would not have retracted because the safety devices were in place before the engines were started.

After the engine was started, the landing gear hydraulic system was re-pressurized. As the gear control lever was in the wrong position and the safety devices had been removed, the nose gear retracted.

CONCLUSIONS:

Findings:

1. Before the first engine was started, the three GEAR DOWN AND LOCKED indicator lights were on, but the gear control lever was not in the GEAR DOWN position.

2. The procedure for checking the emergency landing gear extension system does not require that the gear control lever be placed in the GEAR UP position.

3. The procedure for checking the emergency landing gear extension system requires that the hydraulic system be pressurized when the check is completed. The maintenance crew did not follow this procedure.

4. The front landing gear retracted when the system was re-pressurized after the engine was started.

Causes:
The landing gear control lever was not in the GEAR DOWN position when the first engine was started.

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KAYAHN-AIR LIMITED
CESSNA A185F SKYWAGON C-GIUQ
BIG TROUT LAKE, ONTARIO
09 APRIL 1988

BRIEF NUMBER: 88-C0069 (Accident)
LOCAL TIME: 0945 CDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	982	128
LAST 90 DAYS	134	128

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot landed the ski-equipped aircraft on a frozen lake which had a rough, uneven surface. The left ski struck a frozen ridge of ice, and the landing gear leg failed. The broken leg dug into the snow, and the aircraft pitched forward. The propeller and left wing tip hit the ice, resulting in substantial damage.

An examination of the failed gear leg showed that the leg had failed in overload.

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ICARUS FLYING SERVICES
PIPER PA-23-250 AZTEC C-GDLC
STEPHENVILLE AIRPORT, NEWFOUNDLAND
12 APRIL 1988

REPORT NUMBER: 88-A0094 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1705 NDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,200	250
LAST 90 DAYS	225	225

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft was taking off from runway 10 at Stephenville, Newfoundland for a flight to Grindstone, Québec. During the take-off roll, at an indicated airspeed of approximately 50 mph, the pilot felt the aircraft settle and, thinking that the nose landing gear was retracting prematurely, pulled back on the control column to lift off. The aircraft became airborne, but the stall warning horn sounded, and the aircraft responded poorly to control inputs. The pilot landed the aircraft to prevent it from stalling. The aircraft touched down and slid to a stop with the landing gear retracted.

The landing gear selection lever was found in the gear-down position. An examination of the landing gear determined that it was rigged correctly and that there was no looseness or wear in the linkage. The landing gear was cycled several times, and each time it retracted and extended correctly. A functional check was carried out on the anti-retraction valve, and it was found to function properly.

Two conditions have to be met for the landing gear to retract during normal operation; the landing gear selector lever must be selected up, and the left main landing gear oleo must be within one-quarter inch of full extension. The gear cannot retract if the above conditions are not met unless the downlocks are defective and there is internal leakage in the hydraulic power pack. No deficiencies were found in the system. The cause of landing gear retraction could not be determined.

CONCLUSIONS:

Findings:

1. The landing gear retracted during the take-off roll.

2. No unserviceability was found in the landing gear retraction system.

Causes:

The landing gear retracted during the take-off roll for undetermined reasons.

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CESSNA 172N SKYHAWK C-GUPI
MANNING PARK, BRITISH COLUMBIA 4 mi NW
16 APRIL 1988

REPORT NUMBER: 88-P0068 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1050 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	245	172
LAST 90 DAYS	16	16

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot planned a visual flight rules (VFR) flight from Pitt Meadows, British Columbia to Calgary, Alberta with an en route fuel stop at Revelstoke, British Columbia. The initial route of flight was planned along Number Three Highway to Hope, British Columbia and through the Allison Pass to Princeton, British Columbia.

The pilot obtained a weather briefing and departed Pitt Meadows Airport in the mid-morning. About an hour later, five miles west of the 4,400-foot summit of Allison Pass, the pilot encountered low clouds. He reduced the aircraft's speed to about 65 knots and extended 10 degrees of flap. Moments later, the aircraft struck tree-tops and crashed into the ground. The pilot, who was wearing a shoulder harness, was uninjured; the aircraft was substantially damaged.

The pilot held a valid private pilot's licence. He stated that the aircraft had been operating without any problems during the flight.

A few minutes after take-off, the pilot requested a weather up-date from the Abbotsford Flight Service Station (FSS). The reported weather from Hope Slide(elevation 2,300 feet above sea level) just west of Allison Pass, was four-tenths stratus fractus cloud based at 1,500 feet above ground level (agl), six-tenths stratus cloud based at 3,000 feet agl, and three miles visibility. There are no weather reports from Allison Pass. The Abbotsford FSS operator also advised that visibilities of one mile or less had been reported between Abbotsford and Hope and that no aircraft had flown VFR between the two locations that morning. The pilot replied he was over Mission, British Columbia at 600 feet at that time and that the visibility was between one and a half and two miles.

The pilot later reported to the Abbotsford FSS as he overflew Hope. He stated that he had flown 300 to 400 feet above the Fraser River below low cloud and that the visibility en route had been poor. He reported that conditions looked better to the east of Hope and that he would continue his VFR flight. A witness, who at that time was driving along the highway 25 miles southwest of Hope in the Allison Pass area, stated that the clouds were in the tree-tops and that the visibility was poor.

When the pilot encountered the low cloud near the summit of Allison Pass, he slowed the aircraft and lowered the flaps. When he attempted to fly under the cloud, as he had done earlier in the flight, he found that the clouds gradually merged with the tree-tops. By the time the pilot realized his error, he could not avoid the trees.

CONCLUSIONS:

Findings:

1. Low cloud and reduced visibility existed at the time of the occurrence.

2. Several times during the flight, the pilot flew into weather conditions that were marginal for VFR flight.

3. The pilot flew into the trees when he attempted to fly under a low-cloud ceiling.

Causes:

The pilot continued VFR flight into adverse weather.

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PARACHUTE SCHOOL OF TORONTO
CESSNA 180B SKYWAGON C-FLFB
ARTHUR NORTH AIRPORT, ONTARIO
14 MAY 1988

BRIEF NUMBER: 88-O/0168 (Accident)
LOCAL TIME: 1230 EDT
OPERATION: Specialty Recreational Flying
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	367	5
LAST 90 DAYS	203	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

REPORTED CIRCUMSTANCES:

During the take-off roll, at about 40 mph, the aircraft slowly turned to the right. The pilot overcorrected with left rudder, causing the aircraft to swing to the left, and the pilot corrected with right rudder. The aircraft swung violently to the right, and the pilot applied left brake, causing the aircraft to ground loop to the left and tip onto its right side.

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AIR ONTARIO LTD.
HAWKER SIDDELEY HS748 C-GGOO
MARATHON AIRPORT, ONTARIO
15 MAY 1988

REPORT NUMBER: 88-O/0170 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0700 EDT
OPERATION: Commercial Non-Revenue
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	10,000	150	2,700	500
LAST 90 DAYS	20	20	8	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The aircraft departed from the Timmins Airport at 0550 eastern daylight time (EDT) on an instrument flight rules (IFR) flight to Thunder Bay, Ontario; on board were two crew members. Sioux Lookout was the alternate airport listed on the IFR flight plan.

Shortly after take-off, the crew was informed that the visibility was deteriorating at the Thunder Bay Airport because of ground fog. As the flight progressed westbound, the crew was kept informed of the changing weather conditions at Thunder Bay and of the amended weather forecasts.

At 0628 EDT, as the flight was nearing the Marathon area, the crew was informed that the visibility at Thunder Bay had decreased to one eighth of a mile in fog. As the weather in the Marathon area was good visual meterological flight conditions, the captain decided to land at the Marathon Airport and await improvements in the visibility at Thunder Bay. The crew made a visual approach to runway 34 at Marathon Airport; the aircraft landed long, bounced back into the air, and overran the end of the runway by approximately 300 feet.

The crew was not injured, and the only damage to the aircraft was two blown tires on the right main landing gear.

PERTINENT INFORMATION:

The Marathon Airport is a publicly licensed airport operated by the Corporation of the Township of Marathon. The airport was unattended when the aircraft commenced the approach; however, the attendant was monitoring the airport radio frequency at his residence and was at the airport when the incident occurred.

Runway 34 is 3500 feet long by 100 feet wide with an asphalt surface. The runway surface was wet, but there was no standing water on it at the time of the incident. The runway is equipped with a four-degree angle visual approach slope indicator system (VASIS), which had not been switched on at the time of the occurrence.

At the time of the incident, visual weather conditions were reported with the wind from 250 degrees magnetic at eight knots. The crew made a visual descent from a cruise altitude of 14,000 feet in the vicinity of the airport and flew a right-hand circuit pattern to runway 34.

The Thunder Bay forecast issued 45 minutes after midnight did not forecast any visibility restrictions, but, when the crew received their weather briefing for the flight, at 0506 EDT, the visibility at Thunder Bay was two and one-half miles in fog. The visibility continued to decrease, and the aerodrome forecast was amended. At 0630 EDT, the visibility at Thunder Bay was one eighth of a mile in fog, and the amended aerodrome forecast for Thunder Bay issued at 0617 EDT was occasional visibility of one quarter of a mile in fog until 0800 EDT.

The aircraft was equipped with a Fairchild flight data recorder, part number 13920-221A, which was sent to the National Research Council Flight Recorder Playback Centre for data analysis. The recorder was found to be functioning abnormally due to irregular foil motion and non-standard calibration of altitude and airspeed data; however, after calibration at the Playback Centre, meaningful airspeed, altitude, and heading information was retrieved from the recorder. Analysis of the data revealed that the final approach airspeed and airspeed over the runway threshold were in the range of 115 to 125 knots.

Examination of the runway revealed tire skid marks and fragments of rubber on the last 400 to 450 feet of the runway and off the end of the runway.

The aircraft manufacturer states that the Target Threshold Speed is the speed at which the pilot should aim to cross the runway threshold when landing. This speed provides an adequate margin for controllability and ensures that the computed landing field length is consistently achieved. The Maximum Threshold Speed is the speed at the threshold above which the risk of exceeding the computed landing field length is unacceptably high. If the speed at the threshold exceeds the Maximum Threshold Speed, the landing attempt should normally be rejected.

Marathon Airport and the surrounding terrain were familiar to both pilots. High terrain in the vicinity of the approach required a descent angle of four degrees instead of the usual three degrees on final approach. Both crew members were aware of this. The first officer had not landed on this runway in an HS 748 aircraft, but she had in Beechcraft-type aircraft.

ANALYSIS:

The crew flew a right-hand circuit pattern so that the first officer, who was flying the aircraft from the right seat, would have full view of the runway throughout the approach.

Although the approach was properly planned, the aircraft airspeed on final approach as the aircraft crossed the runway threshold was 15 to 20 knots above the Maximum Threshold Speed, which resulted in the aircraft touching down long and overrunning the end of the runway.

The steeper than normal descent angle that this runway required, combined with the fact that the VASIS was switched off, may have contributed to the crew not stabilizing the aircraft at the Target Threshold Speed, thus preventing them from stopping the aircraft on the runway.

CONCLUSIONS:

Findings:

1. Surrounding terrain required a steeper than normal approach angle to the runway.

2. The VASIS was not switched on.

3. As the aircraft crossed the runway threshold, the airspeed exceeded the Maximum Threshold Crossing Speed by 15 to 20 knots.

4. The aircraft landed long.

5. The aircraft overran the end of the runway on landing.

Causes:

The aircraft landed long and overran the end of the runway because the final approach speed exceeded the correct runway Threshold Crossing Speed.

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CESSNA 180D SKYWAGON C-FMZC
SHEEP MOUNTAIN, YUKON
18 MAY 1988

REPORT NUMBER: 88-W0084 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1100 PDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	694	8
LAST 90 DAYS	165	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger departed from the private airstrip at Sheep Mountain, Yukon on a 45-minute visual flight to North Fork, Yukon. Poor weather was encountered about 35 minutes later, forcing the pilot to turn back. The pilot was concerned about having sufficient fuel to return to his departure point and elected to land and refuel at a private strip at Tatonduk, Yukon. After a brief stop, where he added only one gallon of fuel, he took off and climbed to 5,500 feet above sea level (about 3,000 feet above ground level) en route to Sheep Mountain. Fifteen minutes later, while the aircraft was descending toward Sheep Mountain, the engine lost all power and could not be restarted. The aircraft was force-landed on a sand bar 600 feet short of the airstrip.

Although fuel was usually available at Tatonduk, the pilot discovered that there was only one gallon available. In order to make an accurate determination of the fuel remaining in the aircraft, the pilot drained the fuel from the tanks through the gascolator which he felt would represent usable fuel; a total of six imperial gallons was drained from the aircraft. The six gallons of fuel were then added to the left wing tank. The one gallon found at the strip was added to the right tank. The tank selector was left in the both position.

The pilot was using a Pilot Operating Handbook for a Cessna 180 Model H which indicates the aircraft has 2.5 U.S. gallons of unusable fuel in each tank. In fact, the D model he was flying has a substantially different fuel system and has five U.S. gallons of unusable fuel in each tank when the aircraft is not in level flight. The D model also differs from the H model by having a single outlet located toward the rear of each tank. There was a total of 7.2 U.S. gallons of fuel on board the aircraft at the accident site.

The Sheep Mountain, North Fork, and Tatonduk areas are remote with no weather reporting facilities. There was no means of communication for checking weather at the closest reporting station at the departure airfield or en route.

The aircraft was in its normal nose-high attitude when the pilot drained the fuel at the Tatonduk strip. Because the fuel outlet is closer to the rear of the tank, part of the aircraft's unusable fuel was drained and counted as usable. Although the pilot put most of the fuel in one tank, he left the selector in the BOTH position and the fuel equalized between the two tanks, effectively reducing the amount of usable fuel. When the pilot began the descent at Sheep Mountain, the nose-low attitude caused the fuel to collect at the front of the tanks away from the outlets. After the fuel in the lines from the tanks to the carburettor and in the float bowl was consumed, the engine stopped as a result of fuel exhaustion. Because the pilot was using the incorrect Pilot Operating Handbook for this model of aircraft, he was unaware of the large amount of unusable fuel that could exist.

CONCLUSIONS:

Findings:

1. The pilot was not able to get weather information pertinent to his flight because of the lack of communication facilities and weather reporting stations in the area.

2. The pilot left the fuel selector in the BOTH position, allowing the fuel to equalize between the tanks, thereby reducing the amount of usable fuel.

3. The pilot did not have accurate information about the aircraft fuel system because the Pilot Operating Handbook he was using pertained to a different model.

4. The pilot's initial flight was conducted with insufficient fuel reserves; his second flight was attempted with insufficient fuel.

5. The engine lost all power because of fuel exhaustion.

Causes:

The pilot attempted a flight with insufficient fuel to reach his intended destination.

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V. KELNER AIRWAYS LTD.
DE HAVILLAND DHC 3 OTTER C-FIFP
DOROTHY LAKE, ONTARIO
22 MAY 1988

BRIEF NUMBER: 88-C0109 (Accident)
LOCAL TIME: 1600 CDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,800	900
LAST 90 DAYS	300	300

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot of the float-equipped aircraft was taking off in 10- to 15-knot gusty wind. He rejected the take-off when he believed that the aircraft would not clear a point of land ahead and then taxied the aircraft back to the end of the lake. On the second attempt, the aircraft became airborne, then the right wing dropped, and the wing tip and right float struck the water, causing substantial damage. The pilot again rejected the take-off and taxied the aircraft to shore.

On the previous flight, the right float had scraped against a rock after landing. The pilot had pumped the floats before proceeding to take-off.

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NORTHWINDS NORTHERN INC.
CESSNA 206G SKYLANE C-GQNK
KINOOSA, SASKATCHEWAN
23 MAY 1988

BRIEF NUMBER: 88-C0090 (Accident)
LOCAL TIME: 1615 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	600	80
LAST 90 DAYS	131	70

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

During take-off from a sandy dirt strip, the aircraft hit a bump in the runway and became airborne prematurely. The pilot attempted to increase airspeed by holding the aircraft level; however, the nosewheel dug into a patch of soft sand, and the nose gear fork broke. The aircraft came to rest on its nose.

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AIR SOUTHWEST LTD.
PIPER PA-31 CHIEFTAIN C-GAWL
CHILLIWACK MUNICIPAL AIRPORT,
BRITISH COLUMBIA
26 MAY 1988

REPORT NUMBER: 88-P0105 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1640 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,894	321
LAST 90 DAYS	210	90

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	6

HISTORY OF THE FLIGHT:

The Piper Chieftain with six passengers on board was returning to Chilliwack Municipal Airport following a one-hour local scenic charter flight. The pilot started the landing check several miles north of the airport. When the aircraft joined the circuit downwind for runway 24, the landing check had been partially completed. The pilot extended approach flap, and one of the next items outstanding in the landing check was the lowering of the landing gear. As the pilot was about to lower the gear, one of the passengers enquired as to the function of several control levers. The pilot interrupted his landing check to provide the passenger with an explanation, all the while the approach to the runway was continued. As power was reduced in the landing flare, the pilot heard a warning horn sound. The aircraft then touched down with the gear up and slid approximately 1,000 feet before stopping. The occupants were uninjured.

PERTINENT INFORMATION:

The aircraft is equipped with a landing gear unsafe warning horn which is designed to sound if power to one or both engines is reduced below 12 inches of manifold pressure when the landing gear is not down and locked. If the power on approach is in excess of 12 inches of manifold pressure to achieve a shallow rate of descent, this will prevent the horn from sounding until power is finally reduced for touchdown. Following the accident and subsequent repair, the operator test-flew the aircraft and determined that this gear unsafe warning system was not operating. The warning horn would not sound with the gear retracted and the throttles positioned below the 12-inch manifold pressure position. The operator established that a wire leading to the warning horn microswitches in the throttle quadrant was broken at the terminal.

Under normal circumstances when the gear is selected down, a red transit light will illuminate and then extinguish when the gear is fully extended. In addition, three green down-and-locked indicator lights illuminate when the nosewheel and main landing gear are down and locked. It is normal operating procedure to confirm gear position with these gear indicator lights on final approach.

An approaching stall is indicated by the sounding of a stall warning horn. This warning is activated by a sensing vane on the leading edge of the right wing, and the horn will sound about 4 to 10 knots before an actual stall occurs. In operations involving short-field landings where it is desirable to touch down at the slowest possible speed, it was the accident pilot's experience that the stall warning horn would occasionally activate just prior to touchdown.

ANALYSIS:

The pilot did not lower the landing gear because he interrupted the landing check to answer questions posed by a passenger, and he did not refer back to the checklist prior to touchdown and complete the outstanding items.

The gear unsafe warning system was probably unserviceable at the time of the accident. As there was no cockpit damage caused by the accident, it is likely that the wire in the throttle quadrant was broken before the accident, thus the horn would have been ineffective during the approach prior to the accident. The warning horn that the pilot did hear during the landing flare immediately prior to touchdown was probably the stall warning horn. In support of this determination is the pilot's experience that the stall warning horn occasionally sounded in the flare depending on the landing technique used. Without a serviceable gear unsafe warning horn, the pilot would not know if he had forgotten to lower the gear unless he cross-checked with the gear position indicator lights. As these lights were serviceable, it is concluded that the pilot did not follow normal operating procedure and confirm the gear position with reference to these lights; he was therefore unaware until landing that he had not selected the gear down.

CONCLUSIONS:

Findings:

1. The pilot interrupted the landing check to respond to questions from a passenger.

2. The pilot did not complete the landing check-list during the approach and did not lower the landing gear prior to touchdown.

3. The gear unsafe warning horn was not serviceable due to a broken wire in the warning system.

4. The pilot did not cross check the gear lever position with the gear position indicator lights.

Causes:

The pilot forgot to lower the landing gear because he interrupted the landing check at a critical point in the approach and did not check the gear position annunciator lights and gear handle position prior to landing.

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CENTRAL MOUNTAIN AIR SERVICES LTD.
CESSNA A185F SKYWAGON C-GYIS
RED FERN RAPIDS, BRITISH COLUMBIA
02 JUNE 1988

REPORT NUMBER: 88-P0111 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1400 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	517	100
LAST 90 DAYS	67	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The float-equipped aircraft, with the pilot and three passengers on board, was on a charter flight landing at various places in Tweedsmuir Provincial Park, British Columbia. After stopping at Red Fern Rapids, the pilot decided to taxi down wind, in choppy water, to a more sheltered area for take-off. As he taxied into the calmer water, the pilot noticed that the right float was low in the water. He applied power and started a left turn towards the nearest shore; however, as the aircraft's speed increased, the right float ploughed under the water, and the aircraft overturned. The occupants escaped from the aircraft and clung to its upturned floats for about ten minutes before they were picked up by a boat. There were no injuries.

The access cover for the front compartment of the right float was missing. The pilot had noticed this on his pre-flight inspection and had telephoned the company chief pilot to ask if he should go ahead with the flight without the cover, or postpone the flight until a replacement cover could be obtained. The chief pilot decided that the aircraft should depart without the cover.

The wind at the time of the accident was from the east at 10 to 15 knots, and the aircraft was taxiing south-west in a chop of about 12 inches with a quartering tail wind from the left.

The chief pilot decided that the aircraft should depart without the cover installed because, during take-off and landing, the floats would be in a nose-high attitude and thus the hole would be clear of the water. However, during the long taxi in choppy water, the right float front compartment filled with water through the open access hole, resulting in the aircraft overturning.

CONCLUSIONS:

Findings:

1. The aircraft departed with the access cover to the front compartment of the right float missing.

2. While taxiing in choppy conditions, the right float front compartment filled with water through the open access hole.

3. The right float submerged, and the aircraft overturned.

Causes:

The flight was attempted with the access cover missing from the front compartment of the right float.

* * * * *

SKY TRACTOR LIMITED
CESSNA 188B AGWAGON C-GYWX
LOCKPORT, MANITOBA 3 mi NE
17 JUNE 1988

BRIEF NUMBER: 88-C0119 (Accident)
LOCAL TIME: 2105 CDT
OPERATION: Commercial Aerial Application
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,000	2,500
LAST 90 DAYS	42	42

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot had returned from a spray operation and was landing on the rough, grass strip. The airstrip was wet, and there was a gusty, 90-degree crosswind. After the aircraft touched down, a strong gust of wind struck the aircraft and it began sliding to the left. The pilot applied the brakes, but they were ineffective on the wet grass. The aircraft ran off the runway and into a ditch.

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CONAIR AVIATION LTD.
GRUMMAN CS2F-1 FIRECAT C-FOPX
ABBOTSFORD, BRITISH COLUMBIA
17 JUNE 1988

REPORT NUMBER: 88-P0122 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1530 PDT
OPERATION: Specialty Aerial Control
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	10,000	250
LAST 90 DAYS	8	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

As the aircraft was approaching to land at Castlegar, British Columbia, after a demonstration water-bombing flight, the pilot selected the landing gear down, but the right main gear would not extend. All attempts to lower the right gear, including use of the emergency alternate hydraulic hand pump and inducing high G loads, were ineffective. After consulting with company officials and assessing the weather and aircraft fuel state, the decision was made to fly the aircraft to the company's main base at Abbotsford, British Columbia where a wheels-up landing was made. The pilot was not injured, but the aircraft was substantially damaged.

PERTINENT INFORMATION:

The weather was not a factor in this occurrence; it was overcast, there was a light wind from the northwest, and the temperature was 15 degrees Celsius.

The landing was relatively smooth, and deceleration forces were insufficient to activate the emergency locator transmitter (ELT). The pilot was wearing the helmet and fireproof flying suit issued by the company, and he had also taken the precaution of tightening and locking his shoulder harness inertia reel.

Inspection of the aircraft revealed that a bolt (AN4-15) was missing from one end of the right main wheel door connecting rod assembly. The right door connecting rod interconnects the two main wheel-well doors and ensures that they operate in unison. A push rod is attached to the outboard gear door, which operates the gear uplock mechanism as the doors are opened or closed during the gear operation sequence.

ANALYSIS:

Because the bolt was missing, the two doors were not interconnected. When the gear was selected down and the hydraulic door opening actuator operated, the inboard door overtravelled, and the outboard door, to which the uplock release rod was attached, did not travel far enough. The uplock thus did not release, and the main gear would not extend.

No part of the bolt was found, and it therefore could not be determined if the bolt was lost because the nut and cotter were not secure or because of fatigue or shear failure of the bolt shank.

CONCLUSIONS:

Findings:
1. A bolt was missing from one end of the right main wheel door connecting rod assembly.

2. With the door connecting rod unattached at one end, the outboard door did not fully open, thus the gear uplock was not released.

Causes:
Because a bolt was missing from one end of the right main wheel door connecting rod assembly, the outboard door did not fully open which resulted in the gear uplock not releasing. It was not possible to determine why the bolt was missing.

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PROPAIR INC.
DE HAVILLAND DHC2 BEAVER C-FGCX
LG-2 RESERVOIR, QUÉBEC
19 JUNE 1988

BRIEF NUMBER: 88-Q0167 (Accident)
LOCAL TIME: 1045 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	680	250
LAST 90 DAYS	38	34

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The float-equipped aircraft was carrying a group of biologists to the LG-2 Reservoir. After the first leg of the journey, the pilot landed, and two passengers disembarked. During the ensuing take-off, the oil pressure dropped and the fuel pressure was slow in rising to the normal level. The pilot reported that the oil pressure continued to fall during the short flight that followed. During the final approach, a small quantity of oil was seen on the windshield. The pilot landed the aircraft and asked the two remaining passengers to disembark, and he visually inspected the aircraft; he did not check the engine oil. The pilot did not notice anything unusual and took off. Immediately after take-off, however, the aircraft caught fire. The fire could not be put out with the extinguisher on hand, and the aircraft was almost totally destroyed. The pilot was the only person on board at the time, and he was not injured.

The pilot stated that the oil dilution system may have been defective, injecting an excessive amount of fuel into the engine case.

BEARSKIN LAKE AIR SERVICES LTD.
PIPER PA-31 NAVAJO C-GYQK
THUNDER BAY AIRPORT, ONTARIO
20 JUNE 1988

REPORT NUMBER: 88-C0123 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2111 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,900	300
LAST 90 DAYS	250	250

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The aircraft had flown from Thunder Bay to Sudbury, Ontario, with a cargo of sprinklers on board. After a 17-minute stop to unload, the aircraft took off for the return flight to Thunder Bay. The flight was initially conducted under instrument flight rules at 10,000 feet, but the pilot changed to visual flight rules and descended to 6,500 feet where the head winds were not as strong. One hundred miles from destination, the pilot noticed that the fuel state was lower than he had anticipated and reduced power. Fifteen miles from Thunder Bay, the right engine lost all power, and the pilot feathered the propeller. The pilot continued the flight and positioned the aircraft for a straight-in approach to runway 30. On the final approach, the left engine lost all power, and the pilot carried out a forced landing approximately 1,000 feet short of the runway threshold. Before landing, the pilot lowered the landing gear; however, there was insufficient time for the gear to fully extend. After impact, the aircraft swung 90 degrees right and skidded to a stop 675 feet from the runway. The pilot exited with minor injuries; the aircraft was substantially damaged.

PERTINENT INFORMATION:

Fuel for this aircraft is contained in four wing tanks, totalling 182 U.S. gallons of usable fuel, and two optional nacelle tanks, totalling 54 gallons of usable fuel. The aircraft departed Thunder Bay with full wing tanks and an unknown quantity in the nacelle tanks, although the pilot estimated that the nacelle tanks contained 30 gallons of fuel. After the accident, the fuel tanks were checked; the right wing tanks were dry, and the left wing tanks contained a fractional amount of fuel. The nacelle tanks were dry.

The pilot estimated that 212 gallons would have provided 5 hours and 30 minutes flight time, an equivalent of 38.5 gallons per hour. The estimated flight time for the return trip was 4.5 hours, and the actual flight time logged was 4.4 hours. A review of the journey logbook showed that, for the past few flights, the aircraft was consuming 45 gallons per hour.

The logbook also showed an initial entry of 970 pounds of fuel (166 U.S. gallons) and 1,000 pounds of cargo. This was later changed to 1,270 pounds of fuel (212 U.S. gallons) and 700 pounds of cargo. The weight of the cargo of sprinklers was reported to be 1,000 pounds.

The pilot did not inform air traffic services of his difficulties until the aircraft was on final approach.

ANALYSIS:

The fuel contained in the nacelle tanks was considerably less than what the pilot had estimated. This was because more fuel was used from the nacelle tanks on the previous flight than was expected. As well, the estimated consumption rate of 38.5 gallons per hour for the flight was lower than the actual consumption rate.

Although the pilot was aware of the fuel shortage well in advance of arrival at Thunder Bay, he did not declare an emergency nor otherwise inform air traffic services until he was on final approach. Early declaration of an emergency situation allows supporting ground staffs to take preparatory measures in case of serious consequences.

CONCLUSIONS:

Findings:

1. Both engines lost power due to fuel exhaustion.

2. The fuel consumption rate was higher than that estimated.

3. Air traffic services were not informed of the situation until just prior to the forced landing.

4. Logbook entries were changed to show the aircraft was within the allowable weight limit for take-off from Thunder Bay.

Causes:

The pilot did not ensure that he had adequate fuel for the flight.

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TRANS PROVINCIAL AIRLINES
BRISTOL 170 MK31 FREIGHTER C-GYQY
BRONSON CREEK AIRSTRIP, BRITISH COLUMBIA
21 JUNE 1988

REPORT NUMBER: 88-P0125 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0832 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	15,000	150	7,200	99
LAST 90 DAYS	120	120	110	72

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The pilot and two crew members departed Wrangel, Alaska on a charter flight to Bronson Creek, British Columbia. The Bristol 170 aircraft was carrying a 1,600 U.S. gallon fuel tank filled with jet fuel. The fuel was to be offloaded at Bronson Creek.

Before landing at the Bronson Creek Airstrip, the crew assessed the local wind conditions determined that, although there was a possibility of a tail wind on landing, it was desirable to approach and land from the northeast. The touchdown was normal, with only a slight bounce. During the landing roll, the aircraft drifted towards the right-hand side of the runway. The right main wheel ran off the runway edge and down a few inches into loose coarse gravel that bordered the landing surface. The pilot used a combination of brake and rudder in an attempt to turn the aircraft to the left and back onto the runway. As the right wheel came out of the loose gravel, the aircraft turned sharply to the left, crossed the runway, and ran off the left side. Both main landing gear struts collapsed, and the fuselage split from the nose to the tail when the aircraft crashed into the soft ground. The cockpit area was undamaged, and the crew, all wearing their shoulder harness, were uninjured.

PERTINENT INFORMATION:

The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The weight and centre of gravity were within the prescribed limits. The Bristol 170 is a tail-wheel-equipped aircraft, and it is known to have a pronounced tendency to ground loop.

The captain and the first officer were licensed and trained in accordance with regulations. The captain had been flying the Bristol aircraft for two months and the first officer for four months. They had landed the Bristol 170 aircraft at Bronson Creek Airstrip for the first time on the day before the accident.

There was no weather reporting facility located at the Bronson Creek Airstrip. The crew reported that there was no precipitation and only high clouds present when they landed. The captain reported that a northeasterly outflowing air mass was moving through the area and that he was expecting a tail wind on landing. Small brush piles were burning at various points along the edge of the runway, and the captain stated that the smoke indicated there was little or no wind on the approach and during the initial landing roll. Beyond the half-way point of the runway, he reported that the winds appeared to be variable in strength and direction. A witness standing by the runway said that there was a 10- or 15-knot tail wind for the landing aircraft.

Runway 21, the preferred landing runway at Bronson Creek, was 3,200 feet long, 75 feet wide, with about a three-degree upslope component. An aircraft landing from the opposite direction, on runway 03, would have to overfly high ground on final approach and make a steep descent just before landing. The Bristol 170 aircraft would also require heavy braking to stop it on the downslope of the gravel runway.

There was a parking and fuel storage area adjacent to the right-hand side of the runway from the mid point to the end. The runway edge was well defined until the landing surface joined with the parking area; there, the runway was slightly higher, and a ridge formed between the two surfaces. The terrain bordering the left of the landing strip was clear with a soft and uneven surface.

ANALYSIS:

During the landing roll, the pilot allowed the aircraft to drift toward the right-hand edge of the runway. When the aircraft reached the section of runway adjacent to the parking area, the right main wheel rolled off the runway surface, down the slight incline, and onto the parking area surface. Because the runway edge was poorly defined in this area, the pilot was not aware that the aircraft was approaching the edge of the runway. The drag of the soft ground on the wheel tended to turn the aircraft further to the right, and, to avoid obstacles in the parking area, the captain attempted to manoeuvre the aircraft back onto the runway. As the aircraft started to turn, the right wheel broke free from the soft ground, and the rate of turn increased suddenly, possibly amplified by the tail wind. When this occurred, the pilot was unable to prevent the aircraft from ground looping, and it ran off the runway.

CONCLUSIONS:

Findings:

1. The pilot allowed the aircraft's right main wheel to run off the right edge of the runway.

2. The pilot lost directional control of the aircraft when he attempted to manoeuvre it back onto the runway.

3. The landing gear failed in overload when the aircraft ground looped.

4. There was a tail wind on landing.

5. The edge of the runway was poorly defined.

Causes:
The aircraft's right main wheel ran off the runway, and the pilot lost directional control as he attempted to manoeuvre the aircraft back onto the runway.

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ANGUS AVIATION LTD.
BEECHCRAFT KING AIR 100 C-GXVX
SWAN HILLS AIRPORT, ALBERTA
22 JUNE 1988

REPORT NUMBER: 88-W0118 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1200 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	6,000	1,100	6,400	150
LAST 90 DAYS	150	100	120	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The aircraft was on a flight from Edmonton Municipal Airport to Swan Hills, Alberta with two crew members on board. On touchdown at Swan Hills, the first officer followed normal procedures and selected the propellers to full fine. He then inadvertently selected gear up instead of the flap up. He immediately realized his mistake and reselected the gear handle down. The gear warning horn sounded, the red light in the landing gear selector handle illuminated, and the left gear down-and-locked green light went out. The captain saw these indications and decided to continue the landing roll with minimum braking and minimum reversing. The first officer then selected flaps up. The aircraft rolled approximately 2,400 feet and was nearly stopped when the captain started to turn right onto the taxiway leading to the terminal building. During the turn, the left main gear collapsed, and the left wing dropped onto the runway. Both crew members evacuated the aircraft through the cabin overwing emergency exit.

PERTINENT INFORMATION:

The descent and pre-landing checks were completed using the company-approved check-list. During the pre-landing briefing, it was decided that the first officer would select the flaps up at touchdown without a verbal order from the captain, in accordance with company policy. Three green lights were observed after the gear was lowered, and full flap was selected on the approach.

The aircraft was light, and the landing was slightly downwind; the touchdown was smooth with no bounce. After the inadvertent up-selection, the first officer reselected the gear lever down and noticed that the downlock hook was not in the locked position over the gear lever. As he was looking at the gear handle, the hook snapped into the latched position.

Company operation procedures permitted the flaps to be raised on touchdown to minimize rock damage to the flaps when using reverse thrust on gravel runways.

On the Beechcraft King Air 100, there are two systems which prevent the electrically operated landing gear from retracting on the ground. Both systems are controlled by the right landing gear safety switch. One system is the solenoid-operated downlock hook which prevents the landing gear handle from being raised when the aircraft is on the ground. The other system opens the circuit to the landing gear motor control relay when the aircraft is on the ground. The Beech 100 maintenance manual states that the oleo should compress .87 inches plus/minus .12 inches before the safety switch operates. Subsequent to the accident, the landing gear control system was examined, and it was determined that the safety switch was rigged correctly, that the handle lock hook engaged properly with the aircraft on the ground, and that the landing gear motor would not function with the aircraft on the ground.

The main gear downlocks on the Beech 100 consist of latching lips and plates on the knee of each drag brace. The downlock on the left gear released when the gear was selected up but did not re-engage when the gear was reselected down. The left drag braces were now geometrically slightly overcenter toward the retracted position, and only the retraction mechanism held the left main gear down until the end of the landing roll.

Both pilots were employed by Angus Aviation with captain status, and both regularly flew three aircraft types: the Beech King Air, the Piper Navajo, and the Piper Cheyenne. The first officer had flown approximately seven hours as captain on a Navajo on the previous day. The flap selector on the Navajo is in the same relative position as the gear handle on the King Air.

ANALYSIS:

By not requiring the captain to verbally call for flaps up when landing on gravel strips and by not requiring either pilot to confirm that the flap lever was being selected, company policy increased the risk of an inadvertent gear retraction on touchdown. The first officer, having flown a Navajo the previous day, by force of habit reached for what he believed was the flap selector and lifted it. The right main gear oleo, because of the light aircraft weight and a smooth landing, was not compressed enough to operate the landing gear safety switch. The landing gear started to retract, and, when the first officer reselected gear down, the left main gear downlock did not engage. The retraction mechanism alone was not able to hold the left gear down as the aircraft began to turn at the end of the landing roll.

CONCLUSIONS:

Findings:

1. The first officer inadvertently selected gear up instead of flaps up early in the landing roll.

2. The systems which prevent the gear from retracting on the ground did not function because the right oleo was not compressed enough to operate the landing gear safety switch.

3. Company operating procedures did not detail after touchdown flap selection methodology.

4. The previous day, the first officer had flown another aircraft which had the flap selector in the position of the gear handle on the King Air.

Causes:

The landing gear was inadvertently selected up after landing.

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COLLISION BETWEEN:
DOUGLAS DC-3 C-GYBA and
PIPER PA-23-250 AZTEC C-GMTY
OSHAWA AIRPORT, ONTARIO
06 JULY 1988

REPORT NUMBER: 88-O/0247 (Accident)
LOCAL TIME: 0330 EDT
INFORMATION SOURCE: Field Investigation

DOUGLAS DC-3 C-GYBA

OPERATOR: Skycraft Air Transport Inc.
OPERATION: Commercial Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,500	2,400
LAST 90 DAYS	230	210

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

PIPER PA-23-250 AZTEC C-GMTY

OPERATOR: Skycraft Air Transport Inc.
OPERATION: Commercial Charter
DAMAGE: Substantial
PILOT LICENCE: N/A

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The crew landed at night after a commercial charter flight from Greer, South Carolina to Oshawa, Ontario. After landing, while the aircraft was taxiing to the customs ramp, the brakes failed, and all braking action was lost. The pilot shut down both engines, but, before the aircraft came to a stop, the left wing struck the tail fin of a parked Piper Aztec.

PERTINENT INFORMATION:

This was the completion of the charter flight, and the captain had been on duty for 11 hours.

The weather was good and was not a factor in the accident.

Lighting conditions at the airport, specifically in the customs ramp area, were considered to be adequate. The airport provides a parking area and tiedown facilities near the back of the customs ramp, and the parking area was filled with parked aircraft. The Piper Aztec was parked on the customs ramp at the time of the occurrence.

As the Douglas DC-3 exited Alpha taxiway for the customs ramp, the captain applied the brakes to manoeuvre between the tiedown line and the Piper Aztec, but the brakes did not work. He then requested the co-pilot to switch to the emergency braking system, which also failed to work. Both engines were shut down to allow the aircraft to come to a rolling stop.

A trail of hydraulic fluid was visible from Alpha taxiway to a point on the ramp where the fluid pattern became blotchy, indicating the area where the brakes were applied. Examination of the left outer brake cylinder revealed a one-half-inch-long edge section of the neoprene brake piston seal was missing. This resulted in the loss of hydraulic fluid when the brakes were applied. The seal had been installed two months prior to the accident and failed for undetermined reasons.

ANALYSIS:

Failure of the neoprene brake seal resulted in the loss of hydraulic fluid which rendered both the normal and emergency brake systems unserviceable. Both engines were shut down after the brakes failed, but the aircraft did not stop in time to prevent the collision with the Piper Aztec, nor could the pilot manoeuvre the aircraft.

CONCLUSIONS:

Findings:
1. Hydraulic pressure was lost when the neoprene brake seal failed, rendering the brakes inoperative.

2. The pilot was unable to stop the aircraft or manoeuvre it to prevent a collision with a parked Piper Aztec.

Causes:
A neoprene brake seal failed for undetermined reasons, rendering the brakes inoperative.

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DE HAVILLAND DHC-2 BEAVER C-FGIB
CHUTES-DES-PASSES, QUÉBEC 46 mi NE
13 JULY 1988

BRIEF NUMBER: 88-Q0217 (Accident)
LOCAL TIME: 0940 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,100	250
LAST 90 DAYS	200	200

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot overflew the lake three times to ensure that it was suitable for a water landing. During the landing run, the aircraft encountered a gust of wind, and the left wing rose. The pilot attempted to correct but was unsuccessful, and the right wing struck the water hard. The aircraft spun around, and the rear spar and the right wing tip were substantially damaged. The three occupants were uninjured.

The 3,000-foot-long lake is oriented north/south and is bordered on both sides by mountains. The pilot stated that the wind was from 90 degrees left and gusty.

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OXFORD AIR SERVICES LIMITED
CESSNA A188B AGTRUCK C-GYWB
KAPUSKASING, ONTARIO 40 mi SW
20 JULY 1988

BRIEF NUMBER: 88-O/0275 (Accident)
LOCAL TIME: 0915 EDT
OPERATION: Speciality Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,700	250
LAST 90 DAYS	20	11

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

After completing an aerial spray flight, the pilot returned to land on a road that had been prepared as a landing strip to reload. On short final approach, the pilot noted that he was landing on a portion of the road that had not been prepared. He rejected the landing; however, on the overshoot, the aircraft struck a tree beside the road and stalled. The aircraft descended into the trees and came to rest in an inverted position.

The pilot was familiar with the landing strip, but he had not previously landed on the eastern portion of it. In preparing the road for use as a landing strip, brush had been cut back from the sides of the road but not in the area where the pilot had intended to land.

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KNOX AERIAL SPRAYING LTD.
SCHWEIZER G164B AGCAT C-GKHP
CARBERRY, MANITOBA 3 mi N
29 JULY 1988

REPORT NUMBER: 88-C0160 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0900 CDT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Destroyed
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,000	975
LAST 90 DAYS	200	100

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was taking off from a grass strip to conduct an aerial spray operation in the local area. During the take-off roll, the aircraft struck a depression in the runway and became airborne prematurely. The pilot continued with the take-off, but the aircraft began to settle, and the pilot realized that the wheels would not clear crops growing at the end of the runway. He pulled the emergency dump handle to release the load, but the cable broke, and the hopper door did not open. The aircraft continued to fly for a short period before stalling and descending into the crop field. After coming to rest, the aircraft burst into flames, but the pilot was able to escape without injury.

The aircraft was serviceable prior to the occurrence, and the weight and centre of gravity were within the prescribed limits. Weather was not a factor; the skies were clear and the winds were calm.

A shallow depression, forming a slight lip, ran across the 2,640-foot strip, approximately 750 feet from the end of the runway. It had rained earlier in the morning, and the runway was soft. The pilot normally commenced take-offs from the threshold of the airstrip but, in this instance, started from a position 270 feet from the threshold.

There were distinct wheel marks in the crop field off the end of the runway. Beyond this point, the aircraft struck the ground with the right wing, in a slightly nose-down attitude. The aircraft then slewed to the right, fracturing both landing gear legs before coming to rest. The aircraft caught fire immediately and was destroyed.

The aircraft was equipped with an emergency dump system, consisting of a steel cable running from a D handle in the cockpit to an unlatching lever on the door of the hopper containing the spray chemical. The D handle, which was located on the dash forward of the throttle quadrant, was hanging down from its housing approximately four inches. This caused slack in the cable and also made the handle more difficult to grasp.

The emergency dump cable was examined, and it was found to have snapped near the unlatching lever. Broken strands were noted along the length of the cable which was worn and corroded. The corrosion probably resulted from the chemicals used in aerial application operations.

The aircraft became airborne prematurely when the wheels struck the lip of the depression in the runway. As the aircraft began to settle, the pilot pulled the emergency dump handle, but the frayed and corroded cable broke, and the load did not release. The aircraft continued to settle, and the wheels cut through the grain crop, causing the aircraft to slow and subsequently stall. The soft airstrip may have affected the aircraft's ability to accelerate and lengthened the take-off run; however, the take-off would probably have been successful, had the pilot used the full length of the runway.

The fact that the emergency D handle was not properly housed resulted in the cable being slack. When the pilot grabbed the handle to dump the load, the slackness caused additional stress on the cable at the point of failure and resulted in the cable snapping.

CONCLUSIONS:

Findings:

1. The aircraft became prematurely airborne after striking a depression in the runway and subsequently stalled.

2. The pilot did not use the full length of the runway for take-off.

3. The pilot was unable to dump the chemical load.

4. The emergency dump cable broke because it was frayed and corroded and because the emergency D handle was not properly housed.

Causes:

The aircraft became airborne prematurely.

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YORKTON FLYING SERVICES LTD.
GRUMMAN G164B AGCAT C-GPSM
CARROLL, MANITOBA 2 mi E
31 JULY 1988

REPORT NUMBER: 88-C0163 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0830 CDT
OPERATION: Aerial Application and Distribution
DAMAGE: Destroyed
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,000	400
LAST 90 DAYS	45	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

Following an aerial spray run, the pilot pulled up over hydro wires surrounding the field and commenced a turn to the left. During the turn, the aircraft shuddered, and the pilot levelled the wings but did not lower the nose because there were hydro wires ahead. As the aircraft passed over the wires, the pilot dumped the chemical load; however, the aircraft stalled, crashed into a ditch, and nosed over. The pilot was doused with spray chemical but managed to extricate himself from the wreckage before it was consumed by fire.

Prior to commencing the spraying operation, the pilot had conducted a reconnaissance of the field, noting obstructions. The spray run followed a racetrack pattern, from east to west, with left hand turns. The accident occurred on the second circuit.

The aircraft was serviceable and functioned normally prior to the occurrence. The weight and balance were within the prescribed limits. The wind was from the northwest, at 10 to 12 knots, which provided a quartering head wind during the spray run and a tail wind during the turn after pull-up.

During the pull-up and turn, the pilot allowed the airspeed to decrease until the aircraft shuddered, indicating the onset of a stall. The pilot was unable to take correct stall recovery action as the aircraft would have contacted hydro wires ahead. The chemical load was released in an effort to correct the situation, but insufficient altitude remained to recover safely from the stall.

CONCLUSIONS:

Findings:

1. The pilot allowed the airspeed to decrease during a pull-up and turn following an aerial spray run.

2. The pilot was unable to take correct stall recovery action due to the presence of hydro wires.

3. The aircraft stalled at too low an altitude to effect recovery.

Causes:

The aircraft stalled at an altitude that was insufficient to effect recovery.

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FOUR STAR AVIATION CO. LTD.
PIPER PA-25-235 PAWNEE C-GYWY
ENCHANT, ALBERTA 5 mi NW
03 AUGUST 1988

REPORT NUMBER: 88-W0162 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1030 MDT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	960	200
LAST 90 DAYS	180	160

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was descending over a row of trees to commence a spray run across a field of beans when the main landing gear snagged a power line above the trees. The line from the pole to the left of the aircraft broke away from the pole but remained attached to a pole to the right. The pilot applied full power to pull away from the power line, but the broken end of the cable, with an insulator bracket attached, snagged on the trailing edge of the left wing. The aircraft yawed to the right and struck the ground in about a 10-degree nose-down attitude.

The pilot had flown under the power line on previous runs across the field, but, on the last several passes, a row of trees under the power line had forced him to fly over the line before descending into the field. During his last turn and while descending into the field, the pilot was calculating a required reduction in spray pressure and found that it was taking longer than usual to make the calculation. He had forgotten about the power line until the aircraft struck the cable.

The pilot was flying his first season on agricultural work and had flown 160 hours on spray operations, including a total of 24 hours during three of the last five days. He was up at four o'clock in the morning on the day of the accident, after four hours of sleep.

The chemical being sprayed was BENLATE, a fungicide of low toxicity that did not affect the performance of the pilot.

The pilot's limited experience in spray operations, combined with fatigue resulting from a heavy workload and inadequate rest, affected his ability to make calculations to determine required changes in the spray pressure. While preoccupied with making these calculations, he forgot about the power line bordering the field.

CONCLUSIONS:

Findings:

1. The pilot was probably tired because of a heavy workload and inadequate rest.

2. The pilot forgot about the power line during the time he was calculating a change in spray pressure.

Causes:

The pilot's performance was probably degraded because of fatigue.

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GRUMMAN G164 SUPER AG-CAT C-GSPP
CHARLEVOIX AIRPORT, QUÉBEC 3 mi N
04 AUGUST 1988

BRIEF NUMBER: 88-Q0226 (Accident)
LOCAL TIME: 0625 EST
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,000	1,500
LAST 90 DAYS	100	90

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was flying about 20 feet above ground level during a second spray run when the engine (Pratt & Whitney R1340-AN1) lost partial power. The pilot immediately applied full power but to no avail. He jettisoned the load of herbicide, and the aircraft flew for approximately 400 feet before settling in the trees. The aircraft was extensively damaged.

The outside air temperature was approximately 17 degrees Celsius with very high humidity. The pilot reported that he had not selected or applied carburettor heat in flight and that he suspected the loss of power was caused by carburettor icing.

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WETASKIWIN AERIAL APPLICATORS LIMITED
SCHWEIZER G164B AGCAT C-GUAQ
UNITY, SASKATCHEWAN 10 mi SE
10 AUGUST 1988

BRIEF NUMBER: 88-C0170 (Accident)
LOCAL TIME: 2057 CST
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,250	5
LAST 90 DAYS	25	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was conducting an aerial spray operation in an east to west direction, flying under power lines which were strung across the middle of the field in a north to south direction. It was dusk, and the light conditions were poor. After spraying three-quarters of the field, the aircraft struck the power lines. The pilot dumped the spray load and landed the aircraft safely at his home base.

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STEWART LAKE AIRWAYS LTD.
CESSNA A185F SKYWAGON C-FWMM
STEWART LAKE, ONTARIO
13 AUGUST 1988

BRIEF NUMBER: 88-C0175 (Incident)
LOCAL TIME: 1500 CDT
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	465	280
LAST 90 DAYS	200	200

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was taxiing the float-equipped aircraft near the shore of the lake, in preparation for take-off. The right float struck a submerged rock, holing the float which began to fill with water. The pilot attempted to taxi to shore, but the aircraft listed to the right, and the right wing tip settled into the water. The pilot escaped, and the aircraft slowly nosed over and sank.

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SCHWEIZER TEAL TSC 1A2 C-GDQC
FRASERDALE, ONTARIO 4 mi W
21 AUGUST 1988

BRIEF NUMBER: 88-O/0329 (Accident)
LOCAL TIME: 0800 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	15,000	56
LAST 90 DAYS	165	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot and passenger departed Kapuskasing, Ontario on a flight to a gravel landing strip located four miles west of Fraserdale, Ontario. Weather conditions in the area were excellent with light westerly winds. The pilot made a westbound approach to the landing strip, and, during the flare, the aircraft did not respond normally. The aircraft's nose was raised further, and the tail wheel contacted the runway. The aircraft landed hard and bounced. To recover, the pilot applied full power and attempted an overshoot. The aircraft drifted to the left of the runway toward rising terrain and crashed into low brush.

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AKLAK AIR LTD.
DE HAVILLAND DHC6-300 TWIN OTTER C-FIOK
BAILEY POINT, MELVILLE ISLAND, NORTHWEST TERRITORIES
28 AUGUST 1988

REPORT NUMBER: 88-W0196 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1600 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,500	4,600
LAST 90 DAYS	200	200

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The aircraft had been chartered to supply fuel caches at remote, off-strip sites, in support of an upcoming helicopter operation. After landing, the aircraft was offloaded and refuelled for the return flight. The pilot was taxiing for take-off when the wheels began to sink into the soft tundra. The pilot applied power to keep the aircraft moving, but the nose gear assembly failed and punctured the aircraft's forward fuel tank. The aircraft came to a stop resting upon its nose and main wheels.

PERTINENT INFORMATION:

The aircraft was serviceable and suitable for the fuel haul. It was equipped with high flotation "tundra tires", which enabled the aircraft to land on smooth, unprepared surfaces.

The pilot had over 1,000 hours experience on Twin Otters equipped with tundra tires. Before take-off, he walked out onto the tundra, and he felt confident that a wide gentle turn back to the take-off point would be the most prudent action as he believed that a sharp turn on the soft gravel bar would impose high side loads on the nose gear. While taxiing over the tundra the aircraft became bogged down, and the pilot increased power in an attempt to keep the aircraft moving.

An examination of the wreckage trail showed that the aircraft taxied about 300 feet across the tundra from the gravel area upon which it had landed. During the last 100 feet, all three of the aircraft's wheels sank to a depth of about one foot into the boggy tundra. During the last 30 feet of taxi, the nosewheel sank to a depth of 18 inches. A long gash was found in the under surface of the fuselage, and the forward fuel tank was punctured. The nose oleo was fractured at the top of the nosewheel fork, and some bending was evident near the base of the oleo. A laboratory analysis of the fractured surface of the oleo identified the failure as a bending overload.

ANALYSIS:

The application of power in an attempt to keep the aircraft moving through the soft tundra overstressed the nose gear, causing it to fail.

CONCLUSIONS:

Findings:
1. The nose gear failed in a bending overload condition.

2. Power was increased in an attempt to keep the aircraft moving over the tundra.

Causes:
The application of power in an attempt to keep the aircraft moving through the soft tundra, overstressed the nose gear, causing it to fail.

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BEECHCRAFT 23 MUSKETEER C-FQIS
PENSE, SASKATCHEWAN
28 FEBRUARY 1988

BRIEF NUMBER: 88-C0044 (Accident)
LOCAL TIME: 1200 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	380	190
LAST 90 DAYS	39	9

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot and two passengers were cruising at 3,000 feet above sea level on a visual flight rules (VFR) flight from Regina to Moose Jaw, Saskatachewan. About 15 minutes after take-off, the engine lost all power. The pilot completed an engine failure check, including selecting the carburettor heat on, but the engine did not restart. The pilot force-landed the aircraft in an open field. On touchdown, the right main gear hit a ditch causing substantial damage to the landing gear structure. On roll-out after touchdown, the engine started running again and operated normally until it was shut down.

Environmental conditions at the time of the engine failure were conductive to carburettor icing.

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CESSNA 172M SKYHAWK C-GNKG
ST-JÉRÔME, QUÉBEC
04 MARCH 1988

BRIEF NUMBER: 88-Q0035 (Accident)
LOCAL TIME: 1700 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	135	54
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot and passenger were on a pleasure flight with the intention of landing at St. Adèle Airport. Prior to landing, the pilot was informed that the runway at St. Adèle was not maintained during the winter. He diverted from his intended destination toward another private unlicensed airstrip nearby. On touchdown, the aircraft wheels sank into snow 10 to 16 inches deep. The aircraft decelerated rapidly after the left wing tip and the propeller contacted the snow.

The aerodrome was not maintained during the winter season, and a Notice to Airmen (NOTAM) to that effect had been issued. The pilot was not aware of the NOTAM, nor did he inquire about the runway condition prior to landing. He had been unable to accurately assess the condition of the strip as he circled overhead before landing. The airstrip was being used by ski-equipped aircraft and track snow-vehicles, leaving the impression of a hard-packed snow surface.

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CESSNA 170A C-GNJD
SPIRITWOOD, SASKATCHEWAN 13 mi SE
06 MARCH 1988

REPORT NUMBER: 88-C0052 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1430 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	45	45
LAST 90 DAYS	4	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	2	-	-

HISTORY OF THE FLIGHT:

The pilot and two passengers departed Viking, Alberta, at approximately 1300 central standard time (CST) on a visual flight to Nipawin, Saskatchewan. The pilot did not file a flight plan or flight notification. They intended to watch a hockey game at Nipawin that evening where the son of one of the passengers was playing. No further word was heard from the aircraft, and a search was initiated three and one-half hours after take-off, on confirmation of an emergency locator transmitter (ELT) signal. Because of poor weather, the wreckage was not located until the following day; the aircraft was located in hilly, bush-covered terrain, 183 miles along and four miles south of track. All three occupants had died on impact.

PERTINENT INFORMATION:

The aircraft struck the ground 50 degrees nose down with 45 degrees of right bank. The wreckage trail was 86 feet long, and the type of damage was consistent with impact while the aircraft was in a spiral dive. The stall warning light bulb was recovered, and the filament indicated that the bulb was lit at the time of the crash; however, the wreckage pattern did not indicate a stall condition at impact. The left fuel tank had ruptured and leaked fuel to the surrounding area, and the right tank contained fuel. The control systems were examined, and no evidence of pre-impact failure was found. The head of the right front cylinder of the engine had fractured because of impact forces, but it was possible to rotate the engine freely, and there was compression on the remaining five cylinders. Both magnetos provided a spark when tested. The crankshaft flange had broken away from the crankshaft under high torsional loading, indicating that the engine was operating at impact.

There was no evidence of any pre-accident system or engine malfunction.

A weather front crossed the track at approximately the mid point at the time of the accient giving weather conditions below that required for visual flight rules (VFR) flight, and probably there were ceilings at ground level in hilly terrain. Northeast of the front, the weather forecast called for broken to overcast ceilings 3,000 to 6,000 feet above sea level (asl), with extensive stratus ceilings 400 to 1,000 above ground level (agl), and visibilities of one quarter of a mile to three miles in fog. Southwest of the front, the forecast called for occasional broken ceilings at 3,000 feet asl, with a few altocumulus castellanus clouds to 20,000 feet, and visibilities of two to six miles in light rain showers or light snow showers. Local stratus ceilings were forecast at 600 to 1,500 feet agl. Light rime icing was predicted, with moderate mixed icing forecast in the towering clouds.

Prince Albert, located 70 miles east of the occurrence site, reported the actual weather as a balloon ceiling of 500 feet agl, and visibilities of 12 to 15 miles at about the time of the accident. North Battleford, located 50 miles southwest of the accident site, reported visibilites of 15 miles with ceilings at 10,000 feet or above. Observers in the Spiritwood area noted that snow began to fall at 1100 CST and continued throughout the day. Heavy snow was observed in the occurrence area about the time of the accident. The wreckage site was in hilly terrain that rose 300 to 800 feet above the surrounding area, and, in spots, the terrain is 1,000 to 1,300 feet higher than the elevation of Prince Albert.

The pilot had acquired a student licence and had accumulated approximately 45 hours of flying time, all on the same type of aircraft. The exact amount of flying time could not be determined as he did not maintain a personal log book. He had not received any instrument flying training. Although the pilot had not filed a flight plan, he had informed a family member that he would air file with the Lloydminister Flight Service Station (FSS). Student pilots are not authorized to carry passengers.

The pilot had contacted the Lloydminister FSS that morning, and had received a weather briefing for the flight; the weather was not suitable. The pilot informed the FSS operator that he would check the weather again at noon and was told that a new forecast would be available at that time. However, the pilot did not call back, and there was no evidence that he obtained the latest weather information prior to take-off. No radio transmissions from the aircraft were received by any agency, although the track crossed through the Lloydminister Control Zone.

The autopsy and toxicology reports did not provide any evidence of pilot incapacitation. The pilot was known to be a prudent individual and not given to risk taking. He was progressing satisfactorily with his flying training and had completed a solo cross-country flight the day before the accident.

ANALYSIS:

There was no evidence of an aircraft system of engine malfunction. The impact damage and wreckage pattern were consistent with impact while in a spiral dive.

Although the pilot had been informed earlier in the day of the poor weather conditions to be expected en route, he did not check the weather again prior to take-off, as he indicated he would do. There was no record found of the pilot's checking the weather after take-off, or while en route. The weather associated with the front lying across the track was well below VFR limits and the clouds could probably have extended to ground level in the hilly terrain. Heavy snow showers were in the area, and the conditions were conducive to airframe and carburettor icing.

The actions of the pilot in not checking the weather, in not filing a flight plan, and flying with passengers when not authorized to do so were not consistent with his known character. It was not determined why the pilot undertook the flight in such unfavourable circumstances, but it may have been that his desire to complete the flight so that they could watch the hockey game affected his better judgement.

It was concluded that the pilot continued flight into deteriorating weather, became disorientated, and lost control of the aircraft.

CONCLUSIONS:

Findings:

1. The pilot did not check for the latest weather information prior to take-off.

2. The weather was not suitable for the intended flight.

3. The pilot did not file a flight plan or a flight notification.

4. The pilot was not authorized to carry passengers.

5. There was no evidence of an aircraft system or engine malfunction.

6. The pilot encountered weather conditions that exceeded his capabilities.

7. The pilot became disorientated and lost control of the aircraft.

Causes:
The pilot continued flight into deteriorating weather.

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CESSNA CARDINAL 177RG CF-GEH
ARNPRIOR AIRPORT, ONTARIO
10 MARCH 1988

BRIEF NUMBER: 88-O/0099 (Accident)
LOCAL TIME: 1500 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	250	40
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

While on a short cross-country flight, the pilot entered the circuit at Arnprior, Ontario, intending to carry out a touch-and-go landing. The pilot performed a partial landing check but forgot to lower the landing gear, and the aircraft landed gear up. The gear warning horn was working and did sound.

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CESSNA 150 C-FJZX
KELVINGTON, SASKATCHEWAN
16 MARCH 1988

BRIEF NUMBER: 88-C0056 (Accident)
LOCAL TIME: 1830 CST
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	20	20
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The student pilot was conducting solo circuit training from a private snow-covered strip. On landing, the aircraft veered left and contacted a snow ridge along the side of the runway. The aircraft nosed over and came to rest in an inverted position.

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PIPER PA-23-150 APACHE C-FRGV
HALIFAX AIRPORT, NOVA SCOTIA 2 mi W
17 MARCH 1988

REPORT NUMBER: 88-A0068 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1407 AST
OPERATION: Private Company Business
DAMAGE: Destroyed
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,800	375
LAST 90 DAYS	10	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft departed Halifax, Nova Scotia on a flight to Liverpool. The aircraft took off from runway 33 and was at an altitude of about 300 feet above ground level when the right engine stopped. The pilot turned left to set up an approach to runway 33, and, shortly thereafter, the left engine stopped. The pilot restarted the right engine, but it ran for only a few seconds. The pilot attempted to glide to a small pond, but the aircraft crashed into trees. After the aircraft came to rest, the pilot climbed into the baggage compartment and activated the emergency locator transmitter (ELT).

The aircraft had not been flown for two months, and, during this time, it was parked outside exposed to a variety of weather conditions, which included rain and snow. Prior to the flight, after the aircraft was refuelled, the pilot carried out a fuel drain check. During the fuel drain check, the pilot found water in the fuel, so he continued draining fuel until water was no longer evident.

The fuel filler compartments are recessed in the tops of the wings and incorporate hinged access covers with seals. The fuel tank caps are adjustable thermos-type caps. The flanges into which the caps fit were found to be rusted, and the caps had not been adjusted to fit tightly. During examination of the fuel system, water was found in the fuel tanks, the gascolators, and the carburettors.

Examination of the ELT revealed that the shipping screw, installed to prevent automatic activation during shipping, had not been removed when the ELT was installed in the aircraft. The ELT, which does not have an external antenna, had been installed in the baggage compartment; this did not comply with the manufacture's installation instructions which stated that the ELT should be installed in the cockpit, or near a door or window, and at least one inch from any metal window post. The ELT signal was not received by a Search and Rescue aircraft that was overhead the crash site. The ELT was tested, and it was found to meet all performance requirements.

The source of the water found in the fuel system was probably rain and melted snow that had entered the fuel filler compartments and then leaked past the filler caps. When the aircraft was refuelled, the water was dispersed in the fuel, and not all of it had settled to the bottom of the fuel tanks before the pilot finished the fuel drain check. After take-off, this water entered the carburettors, causing the engines to stop.

The ELT did not activate automatically because the shipping screw had not been removed. When the ELT was turned on by the pilot, the signal was shielded by the aircraft fuselage and was too weak to be received by the Search and Rescue aircraft.

CONCLUSIONS:

Findings:

1. The fuel tank filler caps did not fit tightly, and the fuel tank filler cap flanges were rusted.

2. The fuel drain check was not carried out until after the aircraft was refuelled.

3. After the accident, water was found throughout the fuel system.

4. The engines stopped because of water contamination in the fuel.

5. The shipping screw, which prevents activation of the ELT during shipping, had not been removed.

6. The ELT was installed in a location that did not comply with the manufacturer's instructions.

Causes:

Water entered the fuel tanks through badly fitting fuel tank caps and contaminated the fuel.

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TAYLORCRAFT BC12-65 C-GVMT
GIBSON, BRITISH COLUMBIA 7 mi W
19 MARCH 1988

REPORT NUMBER: 88-P0043 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1700 PST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,000	16
LAST 90 DAYS	6	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft was on a visual flight rules (VFR) flight from Chilliwack to Gibson-Sechelt Airport, British Columbia. As the flight progressed, the pilot noticed a slight decrease in engine rpm. The pilot applied carburettor heat, but this did not restore full power; however, the pilot was able to continue flying with the slight loss of power. About 10 miles from his destination, the pilot reduced power to idle as he began his descent, but, when he attempted to increase power to level off, the engine remained at idle. Continued flight was therefore not possible, and the pilot force-landed the aircraft on a road; during the landing, the pilot swerved into the ditch to avoid an oncoming car. The pilot suffered minor cuts on his face, and the aircraft was substantially damaged.

After the accident, it was found that the throttle cable outer sleeve had separated where it had been badly burned from contact with the engine exhaust manifold. As a result, the inner cable protruded through the outer sleeve and formed a loop rather than moving the carburettor throttle arm when the pilot pushed the throttle control to increase power.

Earlier that day, the aircraft had received an Annual Condition and Conformity Inspection and a 100-hour inspection at Chilliwack. The aircraft maintenance engineer (AME) making the inspection saw that the throttle cable was burned and ordered a replacement; however, he did not ground the aircraft or delay signing off the inspection until this essential part was replaced.

The failure of the throttle cable caused the engine to stay at idle, and the pilot was forced to land on a road.

CONCLUSIONS:

Findings:

1. The throttle cable was damaged from contact with the exhaust manifold.

2. The damaged throttle cable failed.

3. The engine remained at idle power.

4. The pilot made a forced landing and swerved the aircraft into a ditch.

5. The AME certified the aircraft as airworthy knowing the throttle cable was badly burned.

Causes:
The AME did not recognize the seriousness of the damage to the throttle cable.

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CESSNA A185E SKYWAGON C-FZEL
FORT ST. JOHN, BRITISH COLUMBIA 5 mi W
30 MARCH 1988

BRIEF NUMBER: 88-W0053 (Accident)
LOCAL TIME: 1600 MST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,950	1,500
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was landing on a grass strip in a 20- to 30-knot tail wind from the left quarter. The direction of landing was influenced by the presence of a hill and a power line at the far end of the runway. The aircraft skidded to the right on the wet grass, and the right main wheel contacted a ridge of frozen snow along the right side of the strip. The right landing gear failed, resulting in substantial damage to the landing gearbox, right wing, strut, and stabilizer.

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CESSNA 172L SKYHAWK C-GCYE
NORTH BATTLEFORD, SASKATCHEWAN 13 mi E
31 MARCH 1988

BRIEF NUMBER: 88-C0064 (Accident)
LOCAL TIME: 1230 CST
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	500	100
LAST 90 DAYS	10	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot landed on his private farm strip in strong crosswind conditions. Directional control was lost, and the aircraft left the runway and came to rest on its nose. The strip had a curve in it and was muddy and partially snow covered.

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CESSNA 150M C-GPBE
ORILLIA AIRPORT, ONTARIO
02 APRIL 1988

REPORT NUMBER: 88-O/0108 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1200 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	470	197
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The pilot with one passenger on board departed Barrie Airport on a visual flight rules (VFR) flight to Ottawa, Ontario. Approximately 30 minutes into the flight, the pilot carried out a precautionary landing at the Orillia Airport because he was not satisfied with the aircraft's engine performance. He carried out a engine ground run and, after learning that there were no maintenance personnel available at the airport, took off the top engine cowl, removed the winterization kit from the cowl, and then re-installed the cowl. Leaving the passenger on the ground, he taxied to the threshold of runway 12 and took off to check the operation of the engine. Witnesses reported that the aircraft appeared to climb out in a normal manner, and then half to three-quarters of the way along the runway, it stopped climbing and entered a left turn. The sound of the engine decreased as the aircraft stopped climbing and did not increase again. The aircraft wings levelled momentarily, followed by the aircraft entering a steep left turn. The aircraft then pitched nose-down and spun, striking the ground in a near-vertical nose-down attitude, within the confines of the airport. The pilot was fatally injured.

PERTINENT INFORMATION:

At the time of the occurrence, there was high scattered cloud, the visibility was 15 miles, and the wind was from 170 degrees magnetic at 12 knots. The temperature and dew point were +10 degrees Celsius and –03 degrees Celsius respectively. There was sufficient fuel and oil on board the aircraft. It could not be determined what was wrong with the engine prior to the precautionary landing.

Examination of the wreckage did not reveal any evidence of pre-impact failure of the aircraft airframe or flight controls. The flaps were found in the fully extended position. The aircraft was damaged by fire during salvage.

The aircraft engine was moved to a hanger and examined. A compression check was carried out on all four cylinders, and, with the exception of number two, all had compression. The number two cylinder was removed from the engine and examined; no damage was found. The oil screen was removed and examined; although it had trapped a very small quantity of carbon particles, there was no trapped metal. The oil pressure regulator was removed and examined; it was not damaged and was capable of regulating the engine oil pressure. The rocker arm covers were removed and the engine was rotated; the rocker arms of all cylinders were found to be operating normally.

The engine was completely dismantled and the components examined. All components revealed evidence of adequate and clean lubrication. When the valves were removed from the number four cylinder, it was noted that the intake valve displayed unusual markings covering half the circumference of the valve stem. The markings covered an area of approximately 19/32 of an inch from the stem groove to the point where the valve sat above the valve guide.

The cylinder complete with the valve assembly was sent to the CASB Engineering Laboratory for further examination. This examination showed that the damage on the intake valve stem resembled semi-circular nicks with axial smearing of the nicks. Part of the damage was on an area of the stem that operated in and out of the guide; the remainder was above that region and up to the keeper groove. The valves, Continental P/N 641792 (intake) and P/N 646612 (exhaust), had a measured average valve stem hardness of 36.5 Rockwell C for the intake valve and 33.2 for the exhaust valve. The manufacturer's specification requirements are 30-36 Rockwell C for the intake valve and 32+ Rockwell C for the exhaust valve. The valve heads did not appear to be warped.

The intake guide bores were measured at three locations – top, bottom, and centre, and two readings were taken 90 degrees apart. The average of the two readings for the intake guide were: top .3462 inches, bottom .3447 inches, and centre .3440 inches. The readings for the exhaust guide were: top .4381 inches, bottom .4370 inches, and centre .4358 inches. The installed valve guide bore dimension requirements for new guides are: intake .3422 to .3442 inches and exhaust .4370 to .4380 inches.

The number four cylinder rocker arms and shaft were not damaged. The rocker arm for the intake valve was contacting the top of the stem slightly off-centre, but full contact with the stem was still made as was witnessed by the wear marks on the face of the rocker arm. The intake valve head revealed some evidence of "blow-by" by the amount of carbon content on the backside of the head. The inside of the cylinder was clean and damage free.

The engine magnetos were removed intact and taken to an engine overhaul shop for functional testing. Because of fire damage to the ignition leads, a test cap and leads were fitted to the magnetos for testing. The right magneto was tested and functioned normally. The left magneto was tested, but the number four electrode failed to fire. The test cap was removed and the cigarette ends of the ignition leads were found to be coated with engine oil. The number four ignition lead was cleaned off and the magneto tested again. On the second run, the number four electrode fired normally.

The carburettor (Marvel-Schebler MASPA-10-4894) broke free of the intake manifold on impact but was intact. It was examined at an approved overhaul facility. A fuel height test was carried out by placing a fuel line from the test stand to the carburettor drain hole. When fuel pressure was introduced, no fuel flow occurred. The carburettor was then disassembled, and an examination of the bowl revealed that, at the time of manufacture, the drain holes that allow fuel drainage for an inspection or a fuel height test had not been drilled in the bowl.

The float was removed and weighed; its weight was approximately that of a new float. The mixture control valve was removed and examined; it was slightly bent at the top where the control arm attaches. The accelerator pump was examined and found to be functioning normally. The accelerator pump check valve opened when a pressure of 17 to 20 pounds per square inch (psi) was applied by the pump. Normal pressure to open the valve is four to six psi, but this difference would not have affected the engine operation. The idle mixture arm was found to be bent and filed at the mid-point. The mixture cable attach bolt, two washers, and the self-locking nut were still attached to the mixture control arm as they were found at the site.

When the carburettor was disassembled, the primary venturi was found to be loose and detached from the main venturi. Two of the three retaining clips that attach the primary venturi to the main venturi were missing, and the primary venturi was deformed from its normal circular shape.

ANALYSIS:

The fact that the pilot removed the winterization kit from the cowl indicated that the aircraft engine had probably been overheating, which could have caused low and possibly fluctuating oil pressure. If the engine had been overheating, this could have been caused by a combination of the effect of the winterization kit, which reduces air flow over the engine during cold weather operation, and possibly a lean fuel/air mixture caused by the loose primary venturi in the carburettor.

When the pilot carried out the engine ground run, there was no evidence of any engine malfunction; however, the pilot decided to test fly the aircraft without his passenger before making his decision to continue on the cross-country flight or leave the aircraft at Orillia.

The axial smearing on the number four cylinder intake valve stem was consistent throughout the damage and was probably caused by the valve passing through the guide. The nicks on the valve stem could have been caused by the retaining washer during the removal or installation procedure. Since some of the damage would normally be under the keeper and washer, the damage could not have occurred during engine operation. The exhaust valve stem damage was minor and was on a part of the stem where it would not have had any effect on engine operation.

The valves and valve guides of the number four cylinder were within specified tolerances. The damage noted on the valve stems appeared to have occurred recently and could not have occurred during engine operation.

The engine oil found on the cigarette ends of the ignition leads at the magneto was a result of a severe engine oil leak when the starter had separated from the engine and had been repaired some nine months prior to the accident. It appeared that the ignition leads had been oil soaked and the oil worked its way along the leads into the magnetos. Since the spark plugs did not show any evidence of poor ignition or misfiring, it was concluded that the oil-coated cigarette ends did not affect engine operation.

When or how two of the three primary venturi retaining clips became detached from the venturi, or when or how the venturi became deformed in the rebuilt carburettor could not be determined. History of the rebuilding of the carburettor was not available. Carburettor overhaul facilities reported that damage can occur to the primary venturi as a result of a carburettor fire or severe engine backfire through the carburettor; however, there was no record of this having occurred, nor was there any other evidence of fire damage to the carburettor. The absence of the drain holes in the carburettor would not have caused the engine to malfunction.

It was concluded that, on take-off during initial climb from Orillia Airport, the engine lost power because of the loose carburettor venturi which caused the mixture to be incorrect. The pilot decided to land at Orillia Airport, and he commenced a left turn, either to land on the cross runway 22 or on runway 30. The pilot increased the angle of bank in the turn and, while in the steep turn and manoeuvring to align the aircraft with a runway, he extended full flap. The aircraft then stalled and entered a spin at too low an altitude for the pilot to recover.

CONCLUSIONS:

Findings:
1. The pilot removed the engine top cowl and removed the engine winterization shields from the cowl.

2. On initial climb-out, the aircraft entered a steep turn, pitched nose-down, and struck the ground in a near-vertical nose-down attitude.

3. The carburettor primary venturi was loose because two of the three retaining clips were missing.

4. The drain holes for the carburettor bowl had not been drilled out in the bowl casting.

Causes
The engine lost power because the carburettor venturi was loose. The aircraft stalled while the pilot was attempting to force-land the aircraft.

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AERONCA 15AC SEDAN CF-LJE
NEMAIA VALLEY, BRITISH COLUMBIA
03 APRIL 1988

BRIEF NUMBER: 88-P0056 (Accident)
LOCAL TIME: 1130 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	170	N/A
LAST 90 DAYS	7	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was en route and his aircraft's engine began to run intermittently. Unable to maintain altitude, the pilot carried out a forced landing in a rough field and was unable to stop before colliding with a fence. The aircraft was substantially damaged.

The mechanic who inspected the aircraft after the accident found the carburettor finger filter plugged with felt.

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MOONEY M20G C-FQKK
HASTINGS, ONTARIO 1/2 mi S
04 APRIL 1988

REPORT NUMBER: 88-O/0109 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1245 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,272	1,020
LAST 90 DAYS	6	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger departed from the Arnprior Airport on a visual flight rules (VFR) flight to Oshawa, Ontario. In the vicinity of Stirling, they encountered deteriorating weather, and the pilot requested and received an instrument flight rules (IFR) clearance to proceed to Oshawa at 4,000 feet. While climbing in cloud and approaching 4,000 feet, the pilot observed the engine fuel pressure decrease, and he switched on the fuel boost pump. The boost pump did not restore fuel pressure, and the engine began to lose power at which time the pilot applied full carburettor heat. The aircraft engine stopped, and the pilot advised air traffic control that he was carrying out an emergency landing because of an engine failure. The aircraft broke out of cloud about 1,000 feet above ground level, and the pilot landed the aircraft wheels up in an open field.

The aircraft is equipped with two fuel tanks, one in each wing. Fuel is supplied to the engine by selecting either the left or right tank. Fuel gauges for each tank are mounted on the aircraft instrument panel. In this instance, the fuel selector was positioned to the right fuel tank for the duration of the flight.

Following the emergency landing, it was determined that the left fuel tank contained approximately 17 gallons of fuel, and the right tank contained only unusable fuel. With the fuel selector postioned to the right tank, the engine stopped because of fuel starvation.

The Transport Canada Flight Training Manual outlines a vital action power loss check that should be carried out following an engine failure. One of the items on this check-list is to move the fuel selector to another tank known to have fuel in it. Had the pilot selected the left fuel tank, it is most probable that engine power would have been restored.

CONCLUSIONS:

Findings:
1. The aircraft engine stopped in flight when the usable fuel was exhausted from the selected fuel tank.

2. The fuel selector was not selected to the other tank, which contained usable fuel.

Causes:
The pilot did not use the appropriate fuel management technique.

* * *

STINSON HW-75 C-FCHH
GATINEAU AIRPORT, QUÉBEC
09 APRIL 1988

BRIEF NUMBER: 88-Q0070 (Accident)
LOCAL TIME: 1053 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	145	33
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

During the landing run, the aircraft encountered a gust of wind, causing the pilot to lose control. The aircraft ground looped, and the left landing gear collapsed. The 6,000-foot runway is oriented in an east/west direction and is bordered by hills on the north side. A 15-knot wind was blowing at 340 degrees.

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AERONCA 11AC C-FESZ
VANDERHOOF, BRITISH COLUMBIA
10 APRIL 1988

BRIEF NUMBER: 88-P0065 (Accident)
LOCAL TIME: 1630 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	110	5
LAST 90 DAYS	39	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

When the pilot arrived at his destination, the wind was blowing from 230 to 250 degrees magnetic at 20 gusting to 40 knots. Shortly after the aircraft touched down on runway 20, the wind lifted the right wing, and the aircraft ran off the runway into the infield which was soft and muddy. The wheels sank in the mud, and the aircraft nosed over.

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BELLANCA CITABRIA 7ECA CHAMPION N1195E
WHITEHORSE, YUKON 45 mi E
19 APRIL 1988

BRIEF NUMBER: 88-W0067 (Incident)
LOCAL TIME: 1100 YDT
OPERATION: Private Recreational
DAMAGE: None
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	230	130
LAST 90 DAYS	60	60

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was following the Alaska Highway visual flight rules (VFR) flyway en route from Whitehorse to Watson Lake. Shortly after the aircraft passed Summit Lake, the engine lost power, and the pilot force-landed the aircraft on the Alaska Highway. During the descent, the pilot circled the selected landing site twice. Just prior to touchdown, the aircraft passed underneath a power line which had not been visible during the approach.

When the aircraft engine was inspected, two loose bolts were found on the induction system. Before the aircraft departed Fairbanks, Alaska, the intake and exhaust manifold gaskets had been replaced and these bolts had been removed and reinstalled.

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CESSNA 185A SKYWAGON C-FOJC
KILLARNEY, MANITOBA
21 APRIL 1988

BRIEF NUMBER: 88-C0076 (Accident)
LOCAL TIME: 1500 CDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	200	160
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

After landing on the grass strip, the pilot applied the brakes. The left brake did not function, and the aircraft turned to the right then ground looped. The left wheel dug in, and the aircraft rolled up on the left wing before coming to rest in the upright position.

When the brake system was examined, the left brake pads were found to be badly worn.

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CESSNA 180 SKYWAGON C-FYYP
HOUSTON, BRITISH COLUMBIA
27 APRIL 1988

BRIEF NUMBER: 88-P0078 (Accident)
LOCAL TIME: 1040 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	260	37
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

On the third touch-and-go landing on a gravel runway in gusty wind conditions, the pilot lost directional control, and the aircraft ran off the runway. In an attempt to regain directional control, harsh braking was used, and the aircraft nosed over.

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CESSNA 182G SKYLANE C-FPTW
WIARTON AIRPORT, ONTARIO
03 MAY 1988

REPORT NUMBER: 88-O/0147 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1930 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	7,550	1,000
LAST 90 DAYS	50	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was in cruise flight from Wiarton, Ontario to his private strip approximately 12 miles to the southeast when the aircraft suddenly pitched nose-down. The elevators did not respond to input from the control column, but the pilot regained control of the aircraft using the elevator trim control and returned to Wiarton. The pilot was able to maintain adequate control of the aircraft until it bounced on initial touchdown. The aircraft porpoised several times until the nose gear collapsed; the aircraft skidded to a halt on the runway.

The aircraft is equipped with dual controls. Inspection of the aircraft revealed that the control arm of the left elevator arm assembly had failed. A fatigue crack extended over approximately 80 per cent of the fracture surface, and the remainder had failed in overload. This resulted in a loss of elevator control from the left-hand control column. The control arm of the right elevator arm assembly was intact, and the right-hand control column was functional. The pilot was unaware that the other control column was functional.

The pilot was not able to control the aircraft well enough using elevator trim to land the aircraft successfully.

CONCLUSIONS:

Findings:

1. The control arm on the left elevator arm assembly failed in fatigue, resulting in a loss of elevator control from the left-hand control column.

2. The pilot lost control of the aircraft when the aircraft bounced on landing, and he could not control pitch using the elevator trim control.

3. The nose gear collapsed after the aircraft porpoised several times on landing.

4. The elevator controls on the right side of the aircraft still functioned.

Causes:

Elevator control was lost when the left elevator arm assembly failed in fatigue.

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CESSNA 182L C-FZXR
MONTRÉAL/DORVAL AIRPORT, QUÉBEC
06 MAY 1988

BRIEF NUMBER: 88-Q0104 (Accident)
LOCAL TIME: 1510 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	781	29
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot departed for a local round-robin flight. Shortly after lift-off, oil sprayed on the windscreen, and the pilot's forward visibility was severely reduced. The pilot elected to return to the airport. The pilot was looking through the side-door window during the landing, and he misjudged the height and flared the aircraft at approximately 15 to 20 feet above the ground. The aircraft stalled, touched down hard, and bounced before settling on the runway. The aircraft was taxied to the ramp where substantial damage was noticed. The Cessna had been serviced prior to the flight. The pilot reported that, during his walkaround, the fuel cap was only partially tightened and that he did not verify the oil cap. When the pilot opened the access door to the oil filler after shutdown, he noticed that the oil cap was missing and was unable to locate it.

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CESSNA 182E C-GXFL
SALTCOATS, SASKATCHEWAN
12 MAY 1988

BRIEF NUMBER: 88-C0083 (Accident)
LOCAL TIME: 1430 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	100	40
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft was taking off from a dirt road in a strong cross-wind. At lift off, the pilot was unable to maintain directional control. The aircraft drifted sideways and struck a hydro pole.

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CESSNA 120 C-FORY
MASCOUCHE AIRPORT, QUÉBEC
13 MAY 1988

BRIEF NUMBER: 88-Q0113 (Accident)
LOCAL TIME: 0845 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	700	100
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

During the take-off run on runway 29 at the Mascouche Airport, the aircraft swerved to the left on the grass and fell into a ditch. A 25-knot wind was blowing from the right at 90 degrees at the time of the incident.

Because of the force of the wind, the pilot was unable to control the aircraft during the take-off run.

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CESSNA A185E SKYWAGON C-FWEW
BEZANSON, ALBERTA 3 mi E
13 MAY 1988

REPORT NUMBER: 88-W0081 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2000 MDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	750	500
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on a visual flight from Terrace, British Columbia to Grande Prairie, Alberta. On approach to Grande Prairie Airport, the pilot obtained the surface wind conditions and decided to continue to a strip located near his ranch. On approach to the strip, he felt that the winds were unsuitable and selected a nearby cultivated field on the bank of the Smokey River for a landing. The pilot estimated the wind in the landing area to be about 10 knots. He set up an approach into wind and parallel to the cultivated furrows, selected full flap, and approached for touchdown at about 45 knots. From about 10 feet, the aircraft decended quickly and landed on the main gear with the stall warning horn sounding. The pilot did not lower the tail-wheel during the landing roll, and the aircraft continued forward on the main gear for about 165 feet and then nosed over.

At the time of the occurrence, the Grande Prairie winds were reported to be 260 degrees at 15 gusting to 24 knots. The pilot reported that, when he got out of the aircraft, the winds were variable in direction at about 10 knots. The occurrence site is located near a bend in the Smokey River and is about 250 feet lower than the surrounding terrain. The low lying area is sheltered from the westerly winds.

The landing area had been recently cultivated and the top five inches of soil was loosely packed. When the aircraft touched down, the main landing gear wheels sank into the soil about five inches, but the tail wheel did not touch the ground during the landing roll. The Cessna 185 Pilot's Operating Handbook states that "the landing normally should be three-point."

When the pilot selected the landing site, he was not aware that the wind was varying in direction near ground level. When the aircraft was about 10 feet above the ground, a shift in the wind speed or direction caused the aircraft to touch down before it was in the three-point attitude, and, as the ground speed decreased, the wheels sank deeper into the soft soil. Because the pilot did not lower the tail wheel and as a result of the drag on the main gear, the aircraft decelerated rapidly and nosed over.

CONCLUSIONS:

Findings:

1. The field selected was newly cultivated and the main wheels sank into the loosely packed surface.

2. The wind at the selected landing site was variable in direction and speed.

3. The pilot landed the aircraft on the main landing gear and did not lower the tail wheel during the landing roll.

Causes:

The landing was carried out on a soft field, and the pilot did not lower the tail wheel during the landing roll.

* * *

CHAMPION 7GCB CHALLENGER C-FMBA
PARSON'S POND, NEWFOUNDLAND
14 MAY 1988

BRIEF NUMBER: 88-A0128 (Accident)
LOCAL TIME: 1830 NDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,535	48
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

During a cross-country flight, the pilot encountered deteriorating weather, including fog and freezing rain. He attempted to turn around but could not continue, and he made a precautionary landing on a back road. The pilot needed to brake hard because the landing run was short, and the aircraft tipped onto its nose.

* * *

PIPER PA-28-140 CHEROKEE CRUISER CF-XQM
STE. MARTINE, QUÉBEC
22 MAY 1988

REPORT NUMBER: 88-Q0127 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1600 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	296	98
LAST 90 DAYS	66	66

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	2

SUMMARY REPORT:

The pilot and two passengers were completing a short visual flight rules (VFR) flight from Dorval to Ste. Martine, Québec. During a missed approach, the aircraft descended, and the right wing tip struck the ground. The aircraft cartwheeled to a stop and was substantially damaged. The pilot was seriously injured, and the two passengers received minor injuries.

The 2,000-foot sod strip at Ste. Martine is oriented northwest/southeast, and telephone wires are located near the northwest end of the runway. At the time of the accident, there was a cross-wind from the left blowing at right angles to the runway at 10 to 15 knots, which was at or near the maximum acceptable cross-wind for this type of aircraft. The aircraft was being operated at its maximum gross weight of 2,150 pounds.

The pilot was landing at Ste. Martine for the first time. He completed a full visual circuit for runway 33 and, on final approach, selected full flap. The pilot was unable to align the aircraft with the runway because of the cross-wind, and, at an altitude of five feet above ground level, he applied full power to overshoot; the flaps were left fully extended. To avoid the telephone wires at the far end of the runway, the pilot simultaneously initiated a right downwind turn toward open fields. During the turn, the aircraft lost altitude, and the right wing tip struck the ground.

During the overshoot, the climb performance of the aircraft was hampered because the aircraft was being flown at or near its maximum allowable gross weight and the flaps were fully extended. The downwind turn caused a loss of airspeed and lift which resulted in a negative climb capability. The aircraft was unable to sustain flight and struck the ground.

CONCLUSIONS:

Findings:
1. The aircraft was being operated at or near its maximum allowable gross weight.

2. The cross-wind component was at or near the aircraft cross-wind limitation.

3. The missed approach was carried out with the flaps fully extended.

4. The aircraft lift capabilities were affected as the aircraft turned downwind.

Causes:
The pilot left the flaps fully extended and turned downwind while at very low altitude, and the aircraft could not maintain altitude.

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CESSNA 180 SKYWAGON C-GDAW
HOUSTON, BRITISH COLUMBIA
25 MAY 1988

BRIEF NUMBER: 88-P0103 (Accident)
LOCAL TIME: 1515 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	120
LAST 90 DAYS	N/A	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot landed his tail-wheel-equipped aircraft and was rolling out when a gust of wind caused the aircraft to veer to the right and leave the runway. The pilot applied full left rudder but could not correct the swing. The pilot then applied hard braking to avoid running off a four-foot embankment; the braking caused the aircraft to nose over.

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BEECH A24R SIERRA C-GBOY
WATERLOO-GUELPH REGIONAL AIRPORT, ONTARIO
25 MAY 1988

REPORT NUMBER: 88-O/0186 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1535 EDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,260	265
LAST 90 DAYS	10	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

As the pilot was nearing his destination of Waterloo-Guelph Regional Airport, he noticed an improper right gear light indication after he had selected the landing gear down. The pilot made several unsuccessful attempts to extend the landing gear and then landed the aircraft with the gear retracted.

Examination of the gear uplock actuator cylinder revealed that the uplock actuator could only release the right main landing gear from the retracted position when the release hook was manually pushed against the internal spring tension on the adapter. The cylinder was removed from the aircraft and when hydraulic pressure was applied to one of the ports, a continuous flow of hydraulic fluid came from the opposite port. Normally when this test is done, only the small quantity of fluid that remains on the backside of the piston flows out of the opposite port hole. A cross-sectional cut of the cylinder housing was made to reveal the inner mechanism, and it was found that the seals were worn, and the actuating rod was seized within the spacer. In this condition, the seals were not able to prevent the hydraulic fluid from bypassing the pressure port to the return port, and thus the cylinder would not actuate the gear uplock to release the right landing gear.

CONCLUSIONS:

Findings:
1. The aircraft was landed with the landing gear retracted.

2. The right main landing gear uplock actuating cylinder seals were worn, and the actuating rod was siezed.

3. The right main landing gear uplock did not release because of the unserviceable cylinder.

Causes:
The right main landing gear uplock actuating cylinder was unserviceable.

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CESSNA T210L TURBO CENTURION N2264S
COLD LAKE REGIONAL AIRPORT, ALBERTA 1/2 mi S
26 MAY 1988

REPORT NUMBER: 88-W0090 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1445 MDT
OPERATION: Private Other
DAMAGE: Substantial
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,380	130
LAST 90 DAYS	60	60

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	3	-

SUMMARY REPORT:

The aircraft was established on final approach to the Cold Lake Regional Airport, Alberta at about 300 feet above ground level, when the engine lost all power. The pilot force-landed the aircraft in a field half a mile short of the runway. The aircraft slid to a stop within about 50 feet; the main landing gear support structure was driven up into the cabin, distorting the floor and knocking two seats off the seat rails. The three passengers were seriously injured.

There was no fuel found in the fuel tanks or in the fuel injection system. The pilot did not check the quantity of fuel on board the aircraft prior to departure; instead, he had used estimates of fuel consumed on the three previous flights to determine the quantity of fuel that remained. The aircraft had been airborne for about 50 minutes on a visual flight rules (VFR) flight when the engine stopped. For VFR flights, Air Regulations state that there be sufficient fuel on board to fly to the place of intended landing, then for 45 minutes at normal cruise.

The pilot did not accurately determine the quantity of fuel on board the aircraft, and the engine lost all power because of fuel exhaustion. There was not sufficient fuel for the flight nor for the required fuel reserves. The short length of the wreckage trail and the high vertical loads as exhibited by the failed landing gear indicate that the aircraft stalled and descended rapidly prior to touchdown.

CONCLUSIONS:

Findings:
1. The pilot did not determine the quantity of fuel on board the aircraft prior to departure.

2. There was not sufficient fuel on board the aircraft for the flight nor for the required fuel reserves.

3. The engine lost all power because of fuel exhaustion.

4. The pilot stalled the aircraft during the forced landing attempt.

Causes:
The pilot took off without sufficient fuel for the intended flight, and he stalled the aircraft while attempting a forced landing.

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PIPER PA-12 N296SM
FRASER, BRITISH COLUMBIA 1 mi N
29 MAY 1988

BRIEF NUMBER: 88-P0107 (Accident)
LOCAL TIME: 1000 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,300	150
LAST 90 DAYS	200	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot force-landed the aircraft on a road when he encountered poor flying weather. Later, when the weather improved, he attempted to take off from the road. A right quartering tail wind was blowing, and, during the take-off roll, the pilot lost control of the aircraft which then ran off the road into a ditch. Neither the pilot nor his wife was injured. The pilot reported that he did not take off into wind because he would not have been able to see oncoming road traffic.

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CESSNA 150M COMMUTER C-GMFZ

LITTLE FISH LAKE, ALBERTA 1 mi W
29 MAY 1988

REPORT NUMBER: 88-W0095 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1200 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	160	145
LAST 90 DAYS	25	25

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot took off from a private road on a visual flight to Bassano, Alberta. During climb-out, at 30 feet above ground level, the engine (Continental 0-200A) began to run rough and lose power. The pilot applied carburettor heat and leaned the mixture but was unable to regain normal engine power. The pilot flew the aircraft in a nose-high attitude over a gently rising pasture for one mile, then attempted to turn into wind toward lower ground. The aircraft encountered a sudden gust of wind, and the pilot heard the stall warning horn. The aircraft then dropped onto its tail skid, bounced, and struck the ground while in a nose-down attitude, causing the nose gear to collapse.

An examination of the engine determined that the number four cylinder exhaust valve was stuck in the open position; soft carbon deposits were found on the inner surface of the valve guide. The clearances on the valve and guide were within the manufacturer's limits. The aircraft had been operating on purple farm gasoline which is equivalent to regular leaded automobile gasoline.

On a previous occasion, the pilot had experienced a valve sticking during a take-off from his home strip; he was able to fly the rough-running aircraft to a nearby maintenance facility. This may have led him to believe that he could sustain flight with the rough-running engine on this occasion.

The impact area was firm pasture land which was suitable for a forced landing.

The soft carbon deposits on the inner surface of the valve guide caused the exhaust valve to stick open, which, in turn, led to the reduction in engine power. The carbon deposits most probably resulted from the use of leaded farm fuel. Although the field was suitable for a forced landing, the pilot did not choose this alternative but chose to attempt to fly the aircraft to his planned destination. When engine power was lost at low altitude, the pilot attempted to turn, and the aircraft stalled.

CONCLUSIONS:

Findings:

1. The engine lost power as a result of an exhaust valve sticking open.

2. The aircraft was operated on leaded farm fuel.

3. The stuck exhaust valve was a result of carbon buildup, most probably from operation on improper fuel.

4. The pilot attempted to turn the aircraft at a low airspeed and altitude, and the aircraft stalled.

Causes:

An exhaust valve stuck open as a result of carbon buildup caused the loss of engine power. The pilot attempted to turn the aircraft at a low airspeed and low altitude, and the aircraft stalled.

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AERONCA 7BCM CHAMPION C-FNPJ

CLIVE, ALBERTA
29 MAY 1988

REPORT NUMBER: 88-W0098 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1415 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	180	2
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot, with the aircraft owner aboard, was taking off from a grass airstrip when the aircraft swerved to the right and ran off the right edge of the runway onto a soft summer fallow field. The aircraft nosed over and came to rest facing 180 degrees to the direction of take-off.

The airstrip had a 2 per cent downslope in the direction of take-off, and a 20-knot tail wind component existed at the time of departure. The pilot had minimal experience on tail-wheel-equipped aircraft.

The pilot reported that he had problems with directional control during the first 200 feet of take-off, and, after the aircraft swerved left and then right, he was unable to control the aircraft, and he closed the throttle. When the aircraft rolled onto the adjacent field, he was unable to stop the tail from lifting.

The pilot's lack of experience on tail-wheel-equipped aircraft combined with the excessive tail wind caused the pilot to lose directional control of the aircraft on take-off. When the aircraft ran off the runway, the soft ground caused the aircraft to nose over.

CONCLUSIONS:

Findings:

1. The pilot attempted to take-off with a 20-knot tail wind component.

2. The pilot lost directional control of the aircraft.

3. The pilot was inexperienced in the operation of tail-wheel-equipped aircraft.

Causes:

The pilot attempted to take off with excessive tail wind.

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PIPER PA-18-150 SUPERCUB C-FLKL
LOWER LIARD RIVER BRIDGE,
BRITISH COLUMBIA 7 mi E
30 MAY 1988

REPORT NUMBER: 88-W0101 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1800 PDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,000	750
LAST 90 DAYS	50	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft was in level cruise flight, en route to Alaska Strip, British Columbia when the engine (Lycoming O-320-A2B) began to lose power and backfire. The pilot attempted to correct the problem by checking the magnetos, moving the fuel selector, and applying carburettor heat. Application of carburettor heat aggravated the condition, so the pilot selected it off. He diverted toward his private strip, losing engine power and altitude along the way. As the aircraft entered base leg for the strip, the engine stopped, and the pilot force-landed in a clearing, substantially damaging the aircraft.

A detailed inspection of the engine and fuel system at the accident site revealed no discrepancies. The engine was started without difficulty, and it operated normally. The air mass in the area at the time of the occurrence was very humid, and the temperature was about 15 degrees Celsius; these conditions are conducive to the formation of carburettor ice. Gradual engine power loss and backfiring are the classic symptoms of carburettor ice.

When carburettor heat is applied, the resulting water from the melted ice entering the carburettor normally causes the engine to momentarily run even rougher, before normal operation is regained.

The pilot applied carburettor heat in his attempts to restore power; however, because the engine condition worsened with the application of carburettor heat, the pilot, not understanding that this was normal, closed the carburettor heat before normal engine operation could be re-established. The engine eventually failed because of carburettor ice.

CONCLUSIONS:

Findings:

1. The engine lost power and stopped because of carburettor ice.

2. The pilot did not understand fully the operation of carburettor heat.

3. The pilot did not apply carburettor heat long enough to re-establish normal engine operation.

Causes:

The pilot did not operate the carburettor heat control correctly.

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CESSNA 182H SKYLANE C-GMUB
CENTRAL BUTTE, SASKATCHEWAN
02 JUNE 1988

BRIEF NUMBER: 88-C0096 (Accident)
LOCAL TIME: 1310 CST
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,083	538
LAST 90 DAYS	24	24

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was taxiing downwind, in a wind of 25 to 30 knots, and started to turn the aircraft into wind for take-off. The wind lifted the right wing and tail of the aircraft, and the propeller and left wing struck the ground.

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CESSNA 170B C-FJLR
HALIBURTON HIGHLANDS (STANHOPE) AIRPORT, ONTARIO
05 JUNE 1988

REPORT NUMBER: 88-O/0202 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1354 EDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	900	750
LAST 90 DAYS	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The pilot and two passengers were departing from Haliburton to fly to Earlton, Ontario. After take-off, the aircraft struck a hydro cable 25 feet above ground level and continued one-quarter of a mile before striking the ground. The hydro cable fell on a fence and started a brush fire.

The licensed runway at Haliburton is runway 08/26, but there is also an unlicensed grass strip, 1,956 feet long, oriented northwest/southeast, with rising terrain off the northwest end. The airport manager had advised the pilot that the unlicensed strip was not maintained in a condition suitable for use. The grass on about the first 200 feet of the strip was approximately six inches tall. The pilot, however, decided to use the unlicensed strip as the wind was reported as 330 degrees magnetic at 30 knots and gusting. To avoid the long grass, the pilot started the take-off run 200 feet down the runway.

When the aircraft became airborne, it did not have sufficient airspeed to climb; it struck the hydro cable, and the pilot immediately retracted the flaps to gain airspeed. The rising terrain in the departure path produced a downdraft which substantially reduced the aircraft's climb performance. The aircraft's ability to climb in the downdraft was further reduced while the flaps were being retracted. In an attempt to gain altitude and clear the rising terrain, the pilot increased the angle of attack, causing the aircraft to stall.

CONCLUSIONS:

Findings:

1. The long grass on the strip prevented the pilot from using its full length for the take-off run.

2. The aircraft did not gain sufficient altitude to clear the hydro cable at the end of the runway.

3. A downdraft created by the rising terrain substantially reduced the aircraft's climb performance.

4. The pilot increased the angle of attack, and the aircraft stalled.

Causes:
The pilot selected an unsuitable runway for take-off.

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ERICKSON FLYING CLUB INC.
CESSNA 150 C-GZSL
ERICKSON, MANITOBA
07 JUNE 88

REPORT NUMBER: 88-C0108 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1450 CDT
OPERATION: Flying Club Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	190	30
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

Just as the pilot completed the turn to final for landing, the engine started to sputter and then stopped producing power. The pilot attempted to restart the engine but was unsuccessful. He turned to the left, away from the extended centre line of the runway, to avoid flying over a school and people he could see. He continued to fly parallel to the centre line, still hoping to be able to clear the highway crossing his path, though he doubted the aircraft would be able to glide to the runway. Realizing that the aircraft was unlikely to clear the highway and the power line just beyond it, he turned, at low altitude, to the left to roughly parallel the highway. The aircraft crashed in a level, grass area, in a nose-down left-wing-low attitude. It travelled approximately 50 feet and nosed over in the last few feet of travel, snapping the fuselage aft of the cabin area. The pilot, who was using the shoulder harness as well as the seat-belt, was able to exit of the wreckage unaided. He suffered only minor injuries.

The aircraft has two fuel tanks each with a capacity of 13 U.S. gallons for a total of 26 U.S. gallons, of which 22.5 are usable. According to the aircraft owner's manual, at normal cruise power, at an altitude of 5,000 feet, consumption will be about five U.S. gallons per hour. With allowance for start, run-up, taxi, and take-off, approximately four hours fuel is available for cross-country flights. The pilot planned the flight on this basis. (One U.S. gallon equals 3.785 litres.)

The pilot was building up flying time in order to qualify for consideration for a flying position. He flew the aircraft 16 times in the three weeks before the accident. Two days before the accident, the pilot logged a 3.1-hour flight, following which he filled up with 87 litres of fuel, equivalent to 23 U.S. gallons. On the same day, he later flew 2.4 hours and filled up with 71 litres of fuel. On the day of the accident, on the flight preceding the accident flight, he flew 2.7 hours and filled up with 81 litres of fuel. The accident flight lasted 2.8 hours.

The weather was conducive to serious carburettor icing for the early part of the accident flight, and the pilot used full carburettor heat for the first 30 minutes. Thereafter, he was able to climb to 5,500 feet where the weather conditions were good and complete the cruise portion of the flight without carburettor heat. Near destination, only light carburettor icing might have been expected. The temperature and dew point on the surface were estimated to be about 32 and 12 degrees Celsius respectively. The pilot used carburettor heat on descent and in the landing circuit.

The aircraft was about one mile from the runway when the pilot realized that he had to make a forced landing; he first hoped to land close to or on the runway. When he decided he could not clear the highway, the pilot turned away from the village and the highway, through more than 90 degrees, at about 75 to 100 feet above ground. He said he felt the aircraft approaching a stalled condition after the turn was completed and as he was shutting off the fuel and master switch. He put the nose down to avoid the stall and then attempted to raise the nose before hitting the ground.

As the aircraft had nosed over, very little fuel was found in the aircraft. Any fuel found could be accounted for as part of the 3.5 U.S. unusable gallons. The engine was removed from the wreckage and examined. It was found to be capable of producing power. The carburettor was clean and dry, compression was normal and even, and the air filter was extremely dirty.

No explanation, other than fuel exhaustion, could be found for the complete loss of power. The aircraft's fuel consumption was much higher than expected, but the pilot was unaware of that. In three of the last four flights before the accident flight, each over two hours in length, the fuel consumption, based on the amount added to fill the tanks, was 7.4, 7.8, and 7.9 U.S. gallons per hour respectively. A consumption rate of 8.0 U.S. gallons per hour would have accounted for exhaustion of 22.5 U.S. gallons in 2.8 hours.

A number of factors can affect apparent fuel consumption. The only factor positively identified in this case was the condition of the air intake filter.

Regardless of the reason for the high fuel consumption, the accident might not have happened if the pilot had been aware of the rate of consumption. It is good practice to check fuel consumption on longer flights that start with full tanks and which are refilled after the flight.

CONCLUSIONS:

Findings:

1. The aircraft's fuel consumption rate was approximately 60 per cent higher than the handbook value.

2. The pilot was unaware of the high consumption rate.

3. The engine lost all power as a result of fuel exhaustion.

4. The pilot, in attempting to glide closer to the aerodrome after the loss of power, was forced into a turn at very low altitude which led to the crash landing.

5. The pilot was wearing the shoulder harness and escaped serious injury.

6. The carburettor air filter was very dirty.

Causes:

The pilot was unaware that the aircraft's high rate of fuel consumption was higher than the handbook value. The engine lost all power because of fuel exhaustion.

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CHAMPION 7ECA CITABRIA C-FYMK
EAST ST. PAUL, MANITOBA
18 JUNE 1988

REPORT NUMBER: 88-C0120 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1630 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	500	450
LAST 90 DAYS	0	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot, who had not flown for six months, decided on the spur of the moment to go flying. Immediately after the aircraft became airborne, the pilot realized that it was in a nose-down, out-of-trim condition and looked for the elevator trim wheel to retrim the aircraft. While doing so, the left wing struck a row of poplar trees lining the left side of the airstrip. The aircraft then descended, and the nose and left wing struck the ground; the aircraft came to rest in the upright position.

Prior to take-off, the pilot completed all the necessary checks except the elevator trim check. When the aircraft became airborne, the elevator trim was in a forward position, causing the nose-down, out-of-trim condition. The pilot could not locate the trim wheel and had to look for it during a critical stage of flight. While the pilot's attention was diverted, the aircraft drifted left, resulting in the left wing striking the row of trees.

The pilot's licence validation certificate was expired.

CONCLUSIONS:

Findings:

1. The pilot did not set the elevator trim to the correct position prior to take-off.

2. The elevator trim was in a forward position, causing a nose-down, out-of-trim condition when the aircraft became airborne.

3. The pilot could not locate the elevator trim wheel and had to look in the cockpit at a critical stage of flight.

4. While the pilot's attention was diverted, the aircraft drifted left and struck a row of trees.

5. The pilot had not flown for six months and his licence validation certificate was expired.

Causes:
The pilot did not set the elevator trim to the correct position prior to take off.

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PIPER PA-32R SARATOGA N83400
FISHING LAKE, MANITOBA
19 JUNE 1988

BRIEF NUMBER: 88-C0124 (Accident)
LOCAL TIME: 0945 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	910	700
LAST 90 DAYS	14	14

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	5

REPORTED CIRCUMSTANCES:

The fully loaded aircraft was taking off from a grass and gravel private airstrip. The runway was soft due to rain which fell the previous day. The aircraft did not accelerate as expected, and flying speed was not obtained. The aircraft veered off the runway, rotated through 180 degrees, and the landing gear collapsed. There were no injuries.

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PIPER PA-28-180 CHEROKEE N7998W
PRINCE ALBERT, SASKATCHEWAN 6 mi NE
05 JULY 1988

BRIEF NUMBER: 88-C0143 (Accident)
LOCAL TIME: 1140 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	110	110
LAST 90 DAYS	19	19

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The aircraft was approaching Prince Albert, Saskatchewan for landing when the engine lost all power. The pilot carried out a forced landing on a single lane road, in cross-wind conditions. After touchdown, directional control was lost, and the aircraft veered off the road into a field, causing the nose gear to collapse.

The cause of the power loss was fuel exhaustion.

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PIPER PA-12 C-FZKI
LADY BANK, ONTARIO
06 JULY 1988

BRIEF NUMBER: 88-O/0264 (Accident)
LOCAL TIME: 2000 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	300	190
LAST 90 DAYS	8	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was on a pleasure flight and was landing on a friend's private turf field for the first time. The winds were calm, and the temperature was 28 degrees Celsius. The runway had an upslope from the threshold in the direction of landing and then levelled off to a slight downslope. The pilot was not aware of the upslope and flared the aircraft too high over the threshold. The aircraft landed hard, damaging the undercarriage and propeller on impact.

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CESSNA 172I SKYHAWK C-GCCH
REGINA, SASKATCHEWAN 8 mi N
08 JULY 1988

REPORT NUMBER: 88-C0148 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2130 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	550	500
LAST 90 DAYS	0	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot/owner had removed the aircraft from winter storage and prepared it for flight. After the aircraft became airborne, the pilot decided to check the electrical equipment. When the landing lights were turned on, all electrical power was lost and could not be regained. The electrically operated flaps, which were in the UP position, were now inoperative. The pilot attempted to land back on the farm strip but overshot twice because the landing speed was too high. While the pilot was positioning the aircraft for the third approach, the engine lost all power. The pilot attempted to land on a nearby road, but, during the approach, the aircraft contacted a hydro line. The aircraft struck the road in a nose-down attitude, swerved into a ditch, and came to rest in the inverted position.

There was no cloud, the visibility was 15 miles, and the wind was calm. The farm strip was 1,900 feet in length, and there were power lines on the approach path, 2,500 feet from the threshold of the runway. The aircraft could have been landed safely on the runway, with the flaps up.

The aircraft had been in storage since November 1987, and the pilot had not flown since then. Prior to the flight, the pilot installed the battery and visually checked the fuel quantity. He estimated that there was about one inch of fuel in each tank and did not add any fuel. The fuel capacity of the aircraft was 42 U.S. gallons, of which four gallons were unusable. The engine run-up was satisfactory, and all aircraft systems, including the aircraft charging system, appeared serviceable prior to take-off.

The engine was examined and no evidence of a pre-impact malfunction was found. The carburettor was dismantled and was found to be serviceable and free of contaminants; there was no residual fuel in the carburettor. The battery had been used to start the engine; however, the terminals were corroded. The condition of the battery prior to flight was unknown. Battery power was regained after the initial ground impact.

The electrical problem was the result of a poor battery terminal connection due to corrosion. Battery power was lost at some time after the engine was started. When the landing light was selected on after take-off, the sudden demand resulted in complete electrical failure. Battery power was regained when the terminal was jarred during ground impact.

The precise amount of fuel on board prior to starting the engine could not be determined. However, taking into account the four gallons of unusable fuel, the fuel used during engine run-up, take-off and two overshoots, and the lack of fuel in the carburettor, it is concluded that the engine lost power because of fuel exhaustion.

The aircraft crashed because it was not properly prepared for flight following winter storage. The pilot did not ensure that the aircraft systems were serviceable prior to taking off, he did not take adequate care in installing the battery, and he did not ensure there was sufficient fuel on board for the proposed flight. Because the pilot had not flown for eight months, his flying skills had degraded accordingly. His lack of recent flying experience contributed to two unsatisfactory approaches and to the unsuccessful forced landing.

CONCLUSIONS:

Findings:

1. The engine lost power due to fuel exhaustion.

2. The pilot did not ensure that there was enough fuel on board for the flight.

3. A corroded battery terminal resulted in a poor connection and subsequent loss of battery power.

4. The pilot's proficiency was reduced due to his lack of recent flying experience.

Causes:
The pilot did not properly prepare the aircraft for flight.

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PIPER J3 C-65 CUB C-FLDS
AYR, ONTARIO
10 JULY 1988

BRIEF NUMBER: 88-O/0255 (Accident)
LOCAL TIME: 1115 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,664	161
LAST 90 DAYS	14	14

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

While on departure from a grass airstrip, the pilot reported that the aircraft flight control responses were "mushy." At the time, the high ambient air temperature of 32 degrees Celsius resulted in a high density altitude. The pilot rejected the take-off as he felt that he could not gain sufficient altitude to clear the maple trees at the end of the airstrip. The aircraft bounced on touchdown and overran the end of the runway into the trees.

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BEECH V35B BONANZA C-GRWL
IMPERIAL AIRSTRIP, SASKATCHEWAN 2 mi E
14 JULY 1988

BRIEF NUMBER: 88-C0151 (Accident)
LOCAL TIME: 1215 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,300	1,150
LAST 90 DAYS	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot and passenger were flying from Regina to Imperial, Saskatchewan. Nearing destination, moderate rain showers were encountered which reduced forward visibility. There was no wind sock at the grass strip, and, to determine the wind direction, the pilot flew to a nearby farm where a flag was flying. Once he had determined the wind direction, the pilot proceeded with a straight-in-approach. The pilot did not use the pre-landing check-list and forgot to lower the landing gear. The aircraft was landed with the gear retracted.

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CONVAIR L-13 N66370
LLOYDMINSTER, ALBERTA
26 JULY 1988

BRIEF NUMBER: 88-W0143 (Accident)
LOCAL TIME: 1720 MDT
OPERATION: Private – Other
DAMAGE: Substantial
PILOT LICENCE: Commercial (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,000	15
LAST 90 DAYS	80	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot was backtracking for departure on runway 25 with the tail wheel lock engaged. The aircraft was taxiing at 10 miles per hour with a 10-knot tail wind. About 1,000 feet before the threshold of the runway, the aircraft suddenly swung almost 180 degrees to the left; the right wing struck the ground and bent. The tail wheel support was found broken, and the tail wheel assembly bent over.

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BEECH B23 SUNDOWNER C-GOTY
CHURCHILL AIRSTRIP, BRITISH COLUMBIA
18 JULY 1988

BRIEF NUMBER: 88-P0143 (Accident)
LOCAL TIME: 1330 PDT
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	648	613
LAST 90 DAYS	18	18

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

After conducting a low-level inspection pass over the airstrip, the pilot made a left-hand circuit in preparation for a full-flap landing. While on short final, the pilot allowed the aircraft to descend too low, and it touched down approximately 200 feet short of the landing area. The pilot applied power to overshoot, but the left main gear struck a large rock. The gear failed, and the aircraft veered left, coming to rest in the brush along side of the landing strip.

The pilot who was familiar with the airstrip reported that he misjudged the landing flare and that, just prior to landing, the head wind may have suddenly decreased.

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CESSNA 180 SKYWAGON N5327D
WATSON LAKE AIRPORT, YUKON
23 JULY 1988

BRIEF NUMBER: 88-W0148 (Accident)
LOCAL TIME: 1600 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	500	30
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

On landing, the aircraft ground looped and skidded off the runway to the left, causing the right main wheel to fail. The pilot reported that the right rudder control cable retainer spring was disconnected and that the tail wheel would not steer to the right. He also reported that both main gear were out of alignment and that he had little experience on tail-wheel-equipped aircraft.

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PIPER PA-18-150 SUPER CUB C-GRLT
ATLIN, BRITISH COLUMBIA 30 mi SE
24 JULY 1988

BRIEF NUMBER: 88-P0151 (Accident)
LOCAL TIME: 0900 PDT
OPERATION: Private Other
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	1,229
LAST 90 DAYS	N/A	52

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

To counteract the effects of a gusty wind condition, the pilot approached the landing strip with a faster than normal speed. He could not stop the aircraft in time, and, when the aircraft rolled into the rough at the end of the airstrip, its left main landing gear collapsed, resulting in substantial damage to the aircraft.

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CESSNA 182 SKYLANE C-GEIV
MARGARET LAKE AIRSTRIP, ALBERTA
25 JULY 1988

REPORT NUMBER: 88-W0150 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2210 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,600	300
LAST 90 DAYS	6	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The pilot and three passengers were returning to the gravel airstrip following a one-day fishing trip. After a rejected landing on runway 28, the pilot made an approach to runway 10. On landing, the aircraft bounced, the nose gear failed on the subsequent touchdown, and the aircraft nosed over. The four occupants sustained minor head and facial injuries.

The approach to runway 28 was toward the setting sun; because of the glare, the pilot carried out an overshoot and then set up for an approach to runway 10.

The approach to runway 10 was made with a 15-knot right quartering tailwind. The pilot planned to land short in order to remain within an area that was sheltered from the wind by trees. He had seldom used the threshold portion of runway 10 and did not remember an unmarked shallow surface depression located near it. The depression was not mentioned in the Canada Flight Supplement. The pilot selected full flap on short final and reduced power completely. The aircraft landed heavily before the depression and bounced. The pilot did not attempt to recover with power, and the aircraft struck the ground a second time on the rising side of the depression.

On landing, the aircraft was approximately 75 pounds over its allowable gross weight. On-site examination of the aircraft revealed no pre-impact failures or malfunctions. The rear seat had broken completely free of the airframe when the aircraft nosed over. An examination of the seat indicated that it had been attached with only one bolt; the seat was designed to be secured with four bolts.

In an attempt to land short, the pilot selected full flap and reduced power completely. Because of the tail wind component, the aircraft appeared to be going faster than it actually was as it neared the ground. The high rate of descent caused the aircraft to bounce on touchdown; the pilot did not attempt to recover from the bounce, and, when the aircraft struck the rising side of the depression, the nose gear failed in overload, causing the aircraft to nose over.

CONCLUSIONS:

Findings:

1. The aircraft bounced while landing with a tail wind.

2. The pilot did not attempt to recover from the bounce.

3. The aircraft struck a depression which was not mentioned in the Canada Flight Supplement.

4. The nose gear failed in overload on the second landing.

5. The aircraft was over gross weight on landing.

6. The rear seat was not properly attached to the airframe.

Causes:
The pilot did not take appropriate recovery action following a bounce on landing, and the aircraft hit a depression in the runway.

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MAULE M5 210TC STAR ROCKET C-GBPG
SWIFT CURRENT AIRPORT, SASKATCHEWAN
26 JULY 1988

BRIEF NUMBER: 88-C0157 (Accident)
LOCAL TIME: 1650 CST
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	10,000	9
LAST 90 DAYS	275	9

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

During the initial take-off roll, the tail of the aircraft rose prematurely, then came down again. When the aircraft arrived overhead destination, the flight services operator told the pilot that the tail wheel was missing, and the pilot elected to land on the grass adjacent to the runway. The approach and landing were normal, and the pilot held the tail of the aircraft up as long as possible. Near the end of the landing roll, the pilot inadvertently applied brakes, causing the aircraft to tip up onto its nose.

The tail-wheel assembly was later recovered, and the pilot reported a pre-impact fatigue crack on the assembly.

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TAYLORCRAFT BC12D-85 ACE C-FJLF
CRESCENT SPUR, BRITISH COLUMBIA
30 JULY 1988

BRIEF NUMBER: 88-P0168 (Accident)
LOCAL TIME: 1500 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	308	245
LAST 90 DAYS	84	82

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot flew the aircraft, with a passenger and 20 pounds of baggage on board, to Crescent Spur, British Columbia during the mid-afternoon of a pleasant summer's day. The intended landing site at Crescent Spur was a road, and, after circling overhead to assess the landing conditions, the pilot landed into what he estimated to be a 5- to 10-knot head wind. On touchdown, the aircraft veered sharply to the left. To correct the turn, the pilot opened the throttle and applied right rudder. The aircraft became airborne again and turned to the right. When it settled back onto the road, the aircraft was turned toward the right-hand edge of the road. It ran off the road, over rough ground, and into a pile of railroad ties. No one was injured in the accident; however, the aircraft was substantially damaged. The pilot found evidence that the aircraft's left brake had seized.

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PIPER PA-25-235 PAWNEE C-GYBE
PLUMAS, MANITOBA 2 mi NE
31 JULY 1988

BRIEF NUMBER: 88-C0164 (Accident)
LOCAL TIME: 1715 CDT
OPERATION: Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,547	683
LAST 90 DAYS	58	48

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft had been refuelled on the morning of the accident, and several spray flights were flown before operations were stopped because of unfavourable winds. Later in the afternoon, the winds abated, and the pilot prepared to resume spraying. He became preoccupied with adjustments to equipment and with customer demands and did not refuel the aircraft nor check the quantity of fuel in the aircraft tanks. During a spray run, on the second flight of the afternoon, the engine stopped because of fuel exhaustion. The pilot pulled up to avoid power lines at the end of the field but, in so doing, stalled the aircraft. The aircraft descended and struck the ground with considerable force. The pilot was not injured.

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CESSNA 150L CF-FKI
GRAND MANAN ISLAND, NEW BRUNSWICK
03 AUGUST 1988

REPORT NUMBER: 88-A0196 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2100 ADT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,000	400
LAST 90 DAYS	15	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The aircraft was on a visual flight rules (VFR) flight to Grand Manan Island, New Brunswick. Arriving over the island, the pilot found the airport at North Head obscured by fog. The passenger informed the pilot that the new airport further inland, although still under construction, could be used for landing. When the pilot overflew the new airport, the runway was visible so he decided to land. On final approach, the aircraft entered a shallow layer of fog, and the pilot momentarily levelled off. When the runway became visible again, the pilot landed; however, the aircraft touched down long, overran the runway by 250 feet, and nosed over.

The pilot believed the passenger's request to fly to the island was of an urgent nature, so he agreed to make the flight. The pilot knew that a new airport was being built on the island, but he did not know the status of the construction. He relied only on the incorrect knowledge of the passenger, who was a resident of the island. Neither the pilot nor the passenger was aware that the runway had been staked with 8- to 10-inch stakes, in preparation for the final surface grading.

Had the aircraft touched down at or close to the threshold, a landing could have been completed safely in spite of the stakes. When the pilot levelled off momentarily on final approach, the touchdown distance from the threshold was increased and resulted in the aircraft overrunning the end of the runway. Nevertheless, the runway was not operational, and the pilot should not have attempted to land.

CONCLUSIONS:

Findings:

1. The pilot made an approach to a runway that was under construction and was not operational.

2. The pilot entered a shallow layer of fog while on final approach for a landing.

3. The pilot levelled off momentarily but continued the landing when the runway again became visible.

4. The aircraft landed long, overran the end of the runway, and nosed over.

Causes:
The pilot attempted a landing in conditions of reduced visibility on a non-operational runway.

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ZENITH CH200 (Amateur-built) C-GMRF
SWIFT CURRENT, SASKATCHEWAN
06 AUGUST 1988

BRIEF NUMBER: 88-C0168 (Accident)
LOCAL TIME: 1522 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	500	500
LAST 90 DAYS	26	26

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot planned the flight from St. Francis, Manitoba to Swift Current, Saskatchewan. While the aircraft was circling the Swift Current Airport to land, the engine failed because of fuel exhaustion. The pilot reported that, in the last 20 miles, the wind direction and velocity changed, resulting in a strong head wind. The strong, gusty wind prevented the aircraft from gliding to the runway, and the pilot force-landed the aircraft in a ploughed field.

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CESSNA 421C GOLDEN EAGLE N47PK
ST. STEPHEN, NEW BRUNSWICK 11 mi E
07 AUGUST 1988

REPORT NUMBER: 88-A0205 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1335 ADT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Commercial (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,500	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

N47PK departed Saint John, New Brunswick at 1548 Coordinated Universal Time (UTC) in instrument meteorological conditions (IMC) on an instrument flight rules (IFR) flight to Albany, New York, at a flight altitude of 11,000 feet. At 1558 UTC, the pilot advised Moncton Centre that he had shut down an engine and had elected to proceed as filed. The pilot requested and was cleared to maintain 6,000 feet. He then requested and was cleared to maintain 4,000 feet. Shortly thereafter, the pilot advised that he was having difficulty maintaining altitude and that he was at 3,300 feet. Moncton Centre lost radar contact with N47PK at 2,700 feet, just as they were handing him off to Boston Centre. The pilot, unable to contact Boston directly, relayed through another aircraft that he was at 1,300 feet and was "going down." At approximately 1635 UTC, cottagers in an area east of St. Stephen, New Brunswick reported that they had heard a low-flying aircraft and then what they described as a crash into the trees.

A ground and air search was initiated, but the search was hindered by low clouds and fog. At 1930 UTC the following day, the crash was located, and it was confirmed that the pilot had suffered fatal injuries.

PERTINENT INFORMATION:

The pilot had just completed a three-day visit to Saint John and was returning to his home near Hudson, New York where he parked his aircraft at the Columbia County Airport, at an outdoor tiedown site.

The pilot arrived in Saint John on 04 August and, on 05 August, refuelled his aircraft with 392 litres of 100/130 octane aviation gas. No one saw the pilot do a pre-flight inspection of his aircraft or check his fuel for the presence of water prior to his departure on 07 August. Several observers had noted an oil leak on the right engine, and they saw the pilot having difficulty starting the left engine, and, when it did start, it ran rough.

The aircraft was delayed by weather before departing on the accident flight. For several hours before N47PK departed, the weather for Saint John was indefinite ceiling, 0 to 100 feet obscured, visibility 1/8 to 3/4 miles in light drizzle and fog. At 1600 UTC, 12 minutes after N47PK departed, the ceiling was partially obscured, measured 200 feet overcast, visibility one mile in fog, and improving. The weather to the west was essentially the same, without significant improvement until well into the State of Maine. During the pilot's visit to Saint John, there had been no appreciable rain fall, only drizzle and foggy conditions.

The pilot did not inform Moncton Centre as to which engine he had shut down nor why he had shut it down. He did state that he would like to keep heading west, "as long as my temperatures and everything are okay." Finally, when he advised the centre that he was having trouble maintaining altitude on the single engine, he again did not volunteer any explanation as to why he was unable to maintain altitude.

When the pilot relayed to Boston Centre at approximately 1630 UTC that he was "going down", he was 30 miles west of where he had shut down the engine 30 minutes earlier. This position was in the vicinity of where Boston and Moncton last observed the aircraft on radar. These positions coincided very closely with the position where the crash site was eventually located. The crash site was relative to where the cottagers heard the low-flying aircraft.

The aircraft struck the ground at a relatively high airspeed in a 60-degree, nose-down, left-wing-low attitude. The engines and forward fuselage were buried in the soft, tree-covered terrain. On-scene observations showed that the right propeller was feathered. Damage to the left engine and propeller indicated that power was being produced at the time of impact. Two of the left propeller blades had separated from the hub at impact and were buried two to three feet in the ground.

The emergency locator transmitter (ELT) was found in the ARMED position. The antenna lead had been torn from the ELT, so any signals transmitted were not received by search aircraft. After the accident, the ELT was bench-tested and found serviceable.

The wreckage was recovered and examined in CASB facilities with CASB personnel and representatives from Cessna Aircraft Division and Teledyne Continental Motors present. The propellers were taken to McCauley

Propeller Company where they were disassembled and examined by McCauley engineers with CASB personnel present. It was confirmed that the right propeller was feathered at impact and the left propeller was under power.

During the teardown and examination of the engines, there were indications that water had been present in all cylinders. This was evidenced by the presence of rust on the top of the cylinder walls and the presence of loose carbon in some of the combustion chambers.

The wet wing fuel cells split open at impact, and the fuel systems on each engine were destroyed by crash forces. Because of this extensive damage, it was not possible to verify the presence of water in the aircraft fuel system. No water was found in the fuel injectors or the fuel manifolds. A quantity of fuel was recovered from the left wing locker tank, and this fuel was examined and tested. The test results indicated that the fuel was of the correct octane and that it was free of water and contaminants. The fuel supplier's fuel storage tanks were also tested and found to be free of water and contaminants.

The fixed-base operator (FBO) at Hudson, New York, where the pilot kept his aircraft, performed no maintenance on the aircraft other than to remove the left propeller in order to have an oil leak repaired. FBO personnel were not able to work on the aircraft, as they were too busy. However, in their opinion the general appearance of the aircraft indicated a need for timely maintenance. They believed that the aircraft may have only flown about once a week in recent months, and it often required a "jump" or battery charging before starting.

The maintenance to repair the leak in the left propeller was carried out in April 1988; however, this item was not entered in the technical log book. According to the log books, N47PK was due for an annual airworthiness inspection in April 1988.

There were no entries in the log book after the completion of the annual inspection in April 1987. The annual inspection for 1988 was overdue.

The Cessna 421 has a maximum all-up weight of 7,450 pounds. The weight of the accident aircraft was estimated to be 6,798 pounds, and the centre of gravity was within the prescribed limits.

From documentation available as of September 1986, it is believed that the pilot had a total of 6,500 flying hours. However, it was not possible to determine how many hours he had flown recently, nor was his flying proficiency or his experience on the Cessna 421 determined.

The pilot's medical validation certificate expired in February 1988; however, there was no evidence of incapacitation or any physiological factors that might have affected the pilot's performance. There had been a recent family bereavement, but it was not possible to determine the psychological affect on the pilot.

During his stay in Saint John, several people met and talked with the pilot. He complained about the generally high cost of maintaining his aircraft, but he did not mention any specific problem. He appeared to be in a relaxed mood and was enjoying his visit, in spite of the foggy weather. He remarked that he would like to return when the weather was better for sightseeing.

ANALYSIS:

The investigation attempted to determine why the pilot had to shut down the engine and why the remaining engine was not capable of sustaining single-engine flight.

During the flight, the pilot did not offer an explanation or reason for shutting down the engine. When he informed air traffic services that he would like to continue westbound, he said that he would go west "as long as my temperatures and everything are okay." However, it could not be determined whether he was referring to outside air temperature or engine temperature, either of which could have affected the single-engine performance of the operating engine. Also, the pilot did not offer an explanation as to why he was unable to maintain altitude once he had shut down the engine.

When N47PK departed Saint John, the weather was IMC; however, the weather further to the west was better. The pilot probably based his decision to continue en route on these two facts. It could not be determined why, in 30 minutes, the aircraft only progressed 30 miles west from where the engine was shut down. Considering normal single-engine flight operation of the Cessna 421, it is reasonable to believe that the aircraft should have progressed further. The actual flight path of the aircraft during this 30-minute period could not be confirmed. The pilot may have been flying the aircraft in circles. Also, it is not possible to determine whether the pilot applied the appropriate single-engine handling procedures; however, the correct rudder trim was selected for right engine-out configuration.

It is very unlikely that the aircraft was under the pilot's control when it struck the ground. The aircraft had a radio altimeter, so it is probable that the pilot knew he was descending into hilly terrain. As the descent continued and visual meteorological conditons were not encountered, it is probable that the pilot, reacting to the altitude information available and realizing the proximity of the ground, unintentionally allowed the indicated airspeed to decrease below the minimum control speed, which resulted in loss of control, and the aircraft struck the ground in an uncontrolled flight condition.

Although the annual airworthiness inspection was overdue, there was no evidence to indicate that there had been any pre-impact discrepancies with the aircraft.

The engineering examination of the right propeller confirmed that the propeller was feathered. A feathered propeller would create little or no drag, so the possibility of a windmilling propeller interfering with single-engine performance can be disregarded.

The mechanical condition of the left engine indicated that it was capable of producing power. However, it could not be determined how much power the engine was producing.

The examination of both engines and their accessories did not reveal any discrepancies which would have precluded normal operation prior to impact.

The rust that was found in the cylinders during the engine teardowns could have been the result of the 10-day delay between the accident and the workshop inspection. In this period, the engines were exposed to considerable dampness. It rained the night after the accident, and the engines had remained buried in damp ground for two days before they were recovered.

The loose carbon found in some of the cylinders is an indication of water having probably been ingested during the accident flight. However, because each engine is supplied with fuel delivered directly from its associated wing fuel cell and because the wing cells split open on impact and the integral fuel systems were destroyed, there was no opportunity to check for residual water after the accident. If water had been present in the fuel system, it is possible that the resultant rough running engine could have been the reason the pilot shut down the right engine. Continued operation of the left engine would then be questionable and might explain why the single-engine operation was not up to the normally expected performance. However, other than the possible evidence of water ingestion into the cylinders, no water or source of water was found.

CONCLUSIONS:

Findings:

1. The pilot did not give a reason for feathering and shutting down the engine.

2. The pilot did not advise anyone why he was unable to maintain altitude in the single-engine configuration.

3. The aircraft was uncontrolled at the time of the impact.

4. At impact, the right propeller was feathered, and the left engine was producing an undetermined amount of power.

5. Some cylinders showed evidence of water ingestion; however, a source of water could not be found.

6. The available aircraft fuel and the fuel suppliers storage tanks were tested and found to be free of water or contaminants.

7. The overall condition and visual inspection of both engines and accessories did not reveal any discrepancies which would have precluded normal operation prior to impact.

8. The annual aircraft airworthiness inspection was overdue.

9. The pilot's medical certificate had lapsed.

10. The ELT was serviceable; however the ELT antenna lead became disconnected during the crash, rendering the ELT useless.

Causes:

The Canadian Aviation Safety Board was not able to determine why the engine had to be shut down or why the aircraft could not sustain flight in single-engine configuration.

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PIPER PA-25-235 PAWNEE C-GMEF
ELKHORN, MANITOBA 2 mi N
15 AUGUST 1988

BRIEF NUMBER: 88-C0176 (Accident)
LOCAL TIME: 1100 CDT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,700	750
LAST 90 DAYS	95	95

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was taking off from his 2000-foot farm strip to spray crops. The aircraft was at maximum allowable gross weight, the winds were light and variable, and the temperature was 34 degrees Celsius. The aircraft became airborne but could not gain airspeed, and the pilot elected to land straight ahead on a field. During the landing roll, the right wheel struck a small pile of rocks, causing the aircraft to swerve, and the right main landing gear collapsed.

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LUSCOMBE 8F CF-UKZ
AMHERSTBURG, ONTARIO
20 AUGUST 1988

BRIEF NUMBER: 88-O/0332 (Accident)
LOCAL TIME: 1115 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,550	2,595
LAST 90 DAYS	-	-

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was attempting a landing at a private aerodrome. The pilot reported that, on the approach, the aircraft was too high, and, during the landing roll, the aircraft overran the end of the runway and nosed over.

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PIPER PA-24-250 COMMANCHE N5299P
ANAHIM LAKE, BRITISH COLUMBIA
28 AUGUST 1988

BRIEF NUMBER: 88-P0193 (Accident)
LOCAL TIME: 1259 PDT
OPERATION: Private
DAMAGE: Substantial
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	850	100
LAST 90 DAYS	50	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot encountered a strong gust of wind shortly after take-off. The aircraft's airspeed decreased, so the pilot closed the throttle and landed the aircraft near the end of the runway. The aircraft ran off the runway end and continued onto the unprepared overrun area. The aircraft was substantially damaged.

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MOONEY M20G C-FQKK
ARNPRIOR, ONTARIO
29 AUGUST 1988

REPORT NUMBER: 88-O/0345 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1520 EDT
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,750	3
LAST 90 DAYS	52	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft was on a ferry flight from Norwood, Ontario to Arnprior, with the retractable landing gear in the down position. When the pilot landed at Arnprior, the nosewheel began to shimmy, and the landing gear collapsed.

On 04 April 1988, the engine had stopped during a flight, and the owner/pilot had force-landed the aircraft in a field near Hastings, Ontario, with the landing gear in the retracted position. After the initial accident, the ferry pilot, who was also a qualified aircraft maintenance engineer, was hired to recover and repair the aircraft. The aircraft was moved on land to Norwood, Ontario and prepared for the ferry flight.

Prior to the flight, the landing gear was disconnected from the actuator motor and lowered by hand. The landing gear was then reconnected to the landing gear actuator motor, and the landing gear downlocks were secured with polyester rope. The aircraft was inspected by the ferry pilot, and he assessed it to be serviceable for the flight.

Examination of the aircraft after the landing gear collapsed revealed that the nosewheel steering linkage was loose, allowing a turn between five and eight degrees either side of centre. In addition, the roll pins in both of the nose gear retraction tubes were sheared off, and the linkage rods were elongated by about 1¾ inches. The landing gear motor and actuator had pulled forward in the mounting bracket, and the bracket had failed in overload.

When the pilot landed at Arnprior, the nosewheel began to shimmy because of the excessive play in the nosewheel steering linkage. This condition likely resulted from damage to the aircraft during the first forced landing. As a consequence of the nosewheel shimmy, the downlock broke, and the nose gear began to retract. Because of its elasticity, the polyester rope was ineffective in preventing the gear retraction. Although the landing gear motor and actuator initially opposed the retraction of the nose gear, they were eventually pulled out of the previously damaged mounting bracket, and the nose gear collapsed. As the landing gear motor was pulled forward out of the mounting bracket, it also caused an upward force to be applied to the main landing gear retraction tubes. This force then overcame the rope-tied downlocks and resulted in the collapse of the main landing gear.

CONCLUSIONS:

Findings

1. The landing gear had been damaged during a previous accident when the aircraft was force-landed with the landing gear retracted.

2. The preparation and inspection of the aircraft's landing gear was inadequate for the ferry flight to Arnprior.

3. The landing gear collapsed during the landing.

Causes:
The landing gear collapsed because of previous damage and inadequate pre-flight preparation and inspection of the aircraft.

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PIPER PA-18 SUPERCUB CF-TXH
DURHAM-SUD, QUÉBEC
02 SEPTEMBER 1988

BRIEF NUMBER: 88-Q0255 (Accident)
LOCAL TIME: 1330 EDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	819	213
LAST 90 DAYS	141	141

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot, noticing that the engine oil pressure was low and fluctuating, made a precautionary landing on an unprepared field to add a litre of oil. After taking off into wind, estimated by the pilot to be about 15 knots, the aircraft climbed to about 40 feet, then dropped to the ground, and came to rest on a rock pile.

The pilot said the accident was caused by a downdraft which the aircraft encountered close to trees. The pilot suffered minor injuries, and the aircraft was heavily damaged.

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CESSNA 150M C-GFZH
CORMACK, NEWFOUNDLAND
10 SEPTEMBER 1988

BRIEF NUMBER: 88-A0227 (Accident)
LOCAL TIME: 2040 NDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	140	140
LAST 90 DAYS	42	42

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft was on a visual flight rules (VFR) flight from St. Anthony, Newfoundland to Deer Lake, Newfoundland. During the flight, the aircraft encountered a strong head wind. Thirty miles from destination, the weather turned worse than forecast; however, the pilot determined that he did not have enough fuel remaining to turn back. He then had to enter cloud to remain clear of the ground. The aircraft broke out of cloud five miles north of Deer Lake. The pilot requested special VFR to proceed to the airport but was refused at that time because of landing instrument flight rules traffic. He circled a farm field in his immediate area and decided to land. After touchdown, the nosewheel struck a rut and the nosewheel gear collapsed. The nose dug into the ground, and the aircraft nosed over.

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CESSNA 185 SKYWAGON C-FOVO
PICKLE LAKE, ONTARIO
11 SEPTEMBER 1988

BRIEF NUMBER: 88-C0191 (Accident)
LOCAL TIME: 1700 CDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	194	194
LAST 90 DAYS	125	125

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The aircraft was on a visual flight rules flight from Peawanuck to Pickle Lake, Ontario. The pilot landed on the 4,500-foot-long asphalt runway with a quartering tail wind component of five knots. He lost directional control during the landing roll, and the aircraft ground looped. The tailwheel collapsed, and the fuselage sustained some damage.

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CESSNA 150F CF-UPO
WOODSTOCK, NEW BRUNSWICK
17 SEPTEMBER 1988

REPORT NUMBER: 88-A0232 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1300 ADT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	700	615
LAST 90 DAYS	19	19

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The aircraft was taking off in calm winds from a farm field on the return flight to the pilot's home. During the take-off, after becoming airborne, the pilot kept the aircraft two to three feet above the ground until the airspeed increased to around 60 mph. He then pulled the nose up sharply to clear a grove of trees on the take-off path. After clearing the trees, the pilot lowered the nose of the aircraft; the left wing dropped, and the aircraft entered a descending left turn. The pilot applied full right aileron and full right rudder but was unable to regain control before the aircraft struck the ground.

The area of the field selected by the pilot had an available take-off distance of 2,060 feet. The field was rough, grass covered, and had a downslope averaging nine degrees. A row of trees 30 feet high ran diagonally across the end of the field.

The Pilot's Operating Handbook for the aircraft does not contain a take-off distance chart for this type of field. However, the take-off distance chart for a hard-surface runway with a temperature and altitude comparable to this situation indicates that an aircraft operating at a gross weight of 1,600 pounds requires a take-off distance of 1,385 feet to clear a 50-foot obstacle. The calculated take-off weight of the aircraft was 1,503 pounds.

Even though the field selected by the pilot was less than ideal, the take-off distance available was adequate. The performance charts indicate that, had the pilot established a steady rate of climb after lift-off, the aircraft would have been able to climb out over the trees. By holding the aircraft close to the ground and then abruptly pulling up to clear the trees, the pilot induced a stall from which there was insufficient altitude to recover before the aircraft struck the ground.

CONCLUSIONS:

Findings:
1. The pilot used an improper technique for take-off and climb over an obstacle.

2. When the pilot abruptly pulled the nose of the aircraft up, he induced a stall from which recovery was not possible.

Causes:
The pilot used an improper obstacle clearance take-off technique.

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CESSNA 185F SKYWAGON N6480E
SALT PRAIRIE, ALBERTA 2 mi NE
20 SEPTEMBER 1988

REPORT NUMBER: 88-W0217 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1940 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,400	700
LAST 90 DAYS	17	17

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot was preparing to land on a farm strip at Salt Prairie, Alberta, after a short flight from High Prairie. During the turn onto final approach, the aircraft contacted trees and struck the ground short of the runway. The passenger did not survive the impact, and the pilot was seriously injured.

PERTINENT INFORMATION:

The wind was from the south at 10 to 15 knots. The pilot joined the circuit on the downwind leg about 1,900 feet north of the east/west runway, at an altitude of between 300 and 400 feet above ground level. It was his practice to fly a circuit at 90 knots with full flap selected before entering the base leg. The approach area was clear of trees for a distance of 1,100 feet back from the threshold. The turn onto final approach was completed toward the sun, which was setting behind the far end of the runway. Witnesses observed the aircraft over the trees beyond the clearing in a descending steep turn as it manoeuvred from base leg to final. The aircraft collided with these trees and continued to roll, striking the ground nose-down and banked 120 degrees to the right. Witnesses heard the engine accelerate to a high power setting seconds before ground impact. The pilot was unable to remember anything about the last five minutes of the flight.

An on-site examination of the airframe indicated that all flight control systems were intact and operable prior to impact. A shop examination of the engine and propeller revealed no pre-impact discrepancies. The aircraft weight and centre of gravity were within the prescribed limits, and the pilot was licensed in accordance with existing regulations. The flaps were fully extended when the aircraft struck the ground. Shoulder harnesses were installed but not worn by either occupant. The front leg assemblies and the right rear roller housing of the right front seat failed due to overload at impact.

ANALYSIS:

The low altitude flown on the downwind leg may have led the pilot to believe his distance out from the runway was sufficient for a normal turn onto final, when in fact it was less than 2,000 feet. The steep bank angle observed by witnesses suggests the pilot had to increase the rate of turn when the runway came into view to avoid overshooting the centre line. The pilot was then looking into the setting sun, and it is probable that the glare affected his ability to maintain altitude control in the steep turn. He unintentionally allowed the aircraft to descend below his intended approach path and strike the trees short of the runway.

CONCLUSIONS:

Findings:

1. The pilot joined the circuit at a low altitude and flew the downwind leg within 2,000 feet of the runway.

2. The pilot completed the turn onto final, banked steeply to the right, directly into the setting sun.

3. The aircraft struck trees 1,110 feet short of the runway.

4. The pilot did not regain control of the aircraft before it struck the ground.

5. There was no evidence found of any pre-existing airframe or power plant discrepancies.

6. The weight and centre of gravity were within the prescribed limits.

7. Neither occupant used the shoulder harnesses provided.

8. Three leg assemblies of the right front seat failed due to overload at impact.

Causes:
It is probable that the sun glare impaired the pilot's vision, and he unintentionally descended below the intended approach path.

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CESSNA 172N SKYHAWK C-GYZA
CHERHILL, ALBERTA 3 mi SW
01 OCTOBER 1988

REPORT NUMBER: 88-W0219 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1045 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	150	140
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot landed in a small, cut hay field to deplane the passenger at his farm. He touched down with full flaps selected and the power at idle and applied the brakes. The nosewheel dug in momentarily, lifted clear of the ground, then dug in again, and the aircraft nosed over.

The pilot had not landed in the field before, but his passenger felt that it was suitable. The pilot made several passes over the field to confirm its suitablility before he decided to land. Standard soft-field landing technique requires that partial power be used to assist in keeping the nose gear off for as long as possible and that the brakes not be applied. The selected field was about 1,000 feet long and extremely soft and wet under the grass mat surface.

Based on his aerial inspection, the pilot could not tell that the undersurface of the field was too soft to support the aircraft. Because he did not correctly assess the field condition, he did not use the appropriate soft-field landing technique. The nose gear broke through the grass mat on the surface, and the landing gear sank to the cowling, causing the aircraft to nose over.

CONCLUSIONS:

Findings:

1. The pilot selected a field that was too soft for a successful landing.

2. The pilot did not use the appropriate soft-field landing technique.

Causes:
The pilot landed on an unsuitable area using an incorrect landing technique.

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CESSNA 180K SKYWAGON C-GYIW
FORT MCMURRAY AIRPORT, ALBERTA
01 OCTOBER 1988

BRIEF NUMBER: 88-W0221 (Accident)
LOCAL TIME: 1725 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	600	20
LAST 90 DAYS	10	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was returning to Fort McMurray, Alberta in his recently purchased aircraft. During the landing roll-out, he lost directional control, and the aircraft groundlooped to the right, damaging the left wing tip, elevator, and wheel.

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CESSNA 180 SKYWAGON C-GIEZ
HALFMOON BAY, BRITISH COLUMBIA
27 FEBRUARY 1988

BRIEF NUMBER: 88-P0032 (Accident)
LOCAL TIME: 1015 PST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	550	15
LAST 90 DAYS	50	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot took off from Sechelt Airport in his amphibious float- equipped aircraft and landed on the water at Halfmoon Bay with the wheels still extended. The aircraft overturned. The pilot reported that he was thinking about his next flight and neglected to perform a pre-landing check.

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PIPER PA-12 SUPER CRUISER CF-UUL
FLIN FLON, MANITOBA 35 mi NE
07 MARCH 1988

BRIEF NUMBER: 88-C0054 (Accident)
LOCAL TIME: 1800 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	115	N/A
LAST 90 DAYS	3	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The frozen lake was covered with hard crusted drifts. During the take-off run, both skis broke through a crusted drift, and the aircraft nosed over.

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CESSNA 185 SKYWAGON N2531Q
OLD CROW, YUKON 60 mi NE
16 APRIL 1988

BRIEF NUMBER: 88-W0063 (Accident)
LOCAL TIME: 1700 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,067	387
LAST 90 DAYS	39	23

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

Prior to landing on the frozen lake, the pilot inspected the surface to determine the most suitable area for landing the wheel/ski aircraft. Because of snow drifts over a large portion of the lake surface, the pilot selected a wind-swept area and landed with the skis up. When he attemted to turn while taxiing, the aircraft slid sideways and struck a snowbank. The aircraft stopped and tipped onto its wing, damaging the right wing and horizontal stabilizer.

The surface wind was calm, and the ice surface was bare. The outside air temperature was one degree Celsius, and this, coupled with direct sunlight, resulted in a slippery surface.

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FORT RESOLUTION AIR SERVICES LTD.
CESSNA A185F SKYWAGON C-GYKI
YELLOWKNIFE, NORTHWEST TERRITORIES
29 APRIL 1988

BRIEF NUMBER: 88-W0071 (Accident)
LOCAL TIME: 1914 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,700	1,500
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot landed the ski-equipped aircraft on patchy, rough snow covering the airport infield. On touchdown, the right ski contacted an area of bare ground, and the aircraft swerved to the right. The right landing gear collapsed, and the right wing, horizontal stabilizer, and propeller were damaged when they contacted the ground.

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PIPER J-3 CUB CF-IFW
DOWNES LAKE, ONTARIO
04 MAY 1988

REPORT NUMBER: 88-O/0148 (Accident)
INFORMATION SOURCE: Field investigation
LOCAL TIME: 1345 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	200	175
LAST 90 DAYS	1	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and one passenger took off toward the southwest from a small lake for a local fishing trip. Engine performance appeared normal; however, the aircraft was slow to lift off the water. To get the aircraft airborne, the pilot lifted first one float then the other out of the water. The aircraft finally lifted off and started to climb out; however, most of the available take-off distance was used before the aircraft became airborne. The pilot manoeuvred around trees on the shoreline, but he was unable to climb above rising terrain, and the aircraft crashed into a stand of poplar trees. Neither occupant was injured.

The weather was suitable for visual flight. The surface winds were light from the northeast and produced a slight ripple on the lake surface. There were no wind indicators on the shore to indicate the wind direction.

The lake was approximately 3,300 feet long in the direction of the take-off. The terrain that surrounded the southwestern shore of the lake sloped upward approximately 50 feet within 500 feet of the shore, and the area was covered with trees between 15 and 35 feet tall. The opposite shoreline was swampy without any significant rise in terrain elevation for approximately 3,300 feet from the lake shore.

There were no faults found with the aircraft. The load, which brought the gross weight close to the maximum allowable, included approximately 30 pounds of fishing gear and 11 U.S. gallons of fuel. In addition, an estimated 50 to 100 pounds of water was found in the aircraft floats, although the pilot reported that he had pumped out the floats prior to the attempted flight.

The near glassy surface of the lake combined with the downwind take-off made it difficult for the heavily laden aircraft to become airborne. The take-off used most of the available take-off distance, and, when the aircraft did become airborne, the heavy take-off weight and tail wind combined to degrade the aircraft's climb performance, and the aircraft was not able to climb above the surrounding terrain.

CONCLUSIONS:

Findings:

1. The aircraft was loaded close to its maximum gross weight.

2. The pilot took off in a downwind direction.

3. Most of the available take-off distance was used up before the aircraft became airborne.

4. Once airborne, the aircraft was unable to climb above the surrounding terrain.

5. The aircraft floats contained 50 to 100 pounds of water.

Causes:
The aircraft was unable to climb above surrounding terrain due to the combined effect of its heavy weight and the tail wind.

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CESSNA 180G SKYWAGON C-FPGS
PORT McNEILL, BRITISH COLUMBIA
11 MAY 1988

BRIEF NUMBER: 88-P0087 (Accident)
LOCAL TIME: 1630 PDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	136	21
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

During the approach for a glassy-water landing, the pilot was maintaining a nose-high attitude using the horizon for reference. He became disoriented when he looked down at the water surface, and the attitude of the aircraft changed. The right float dug into the water and the aircraft cartwheeled. There were no injuries.

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CESSNA 180 SKYWAGON CF-TBR
RED LAKE, ONTARIO
12 MAY 1988

BRIEF NUMBER: 88-C0084 (Accident)
LOCAL TIME: 1900 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,000	2,000
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot had landed the float-equipped aircraft on Red Lake and was taxiing with a strong quartering tail wind. As the aircraft entered a sheltered bay, a gust swung it into the wind and lifted the right wing. The left wing struck the water, and the aircraft slowly rolled over and sank.

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CESSNA 180H SKYWAGON C-FYJD
WINDY BAY, BRITISH COLUMBIA
21 MAY 1988

REPORT NUMBER: 88-P0101 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1530 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	480	320
LAST 90 DAYS	35	35

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger departed Queen Charlotte City, British Columbia in the float-equipped aircraft on a camping trip to one of the lakes to the south. While circling Windy Bay at 800 feet above the surface, the aircraft was struck by a large brown bird. The aircraft started to vibrate severely, and the pilot decided to carry out an emergency landing on Windy Bay. On landing in an open area of water, the aircraft struck large swells, and the float struts broke, flipping the airplane over. The pilot and passenger, who were not wearing life-jackets, were uninjured and escaped from the aircraft. They clung to the overturned aircraft until it began to break up in the swells and then swam to shore, approximately 50 yards away. Two days later they were rescued by a passing boat.

The bird was possibly an eagle as they are common in that area and have been known to attack aircraft that fly in their vicinity. When the bird struck the aircraft, the propeller may have been damaged, resulting in a severe out-of-balance condition.

The occupants did not have time to locate and don life-jackets before exiting the aircraft. It was fortunate that the accident occurred a short distance from shore and that they were able to swim to safety without life-jackets.

CONCLUSIONS:

Findings:

1. The aircraft struck a large bird.

2. Severe vibration forced the pilot to make an emergency landing in open water.

3. The large swells on the landing surface caused the float struts to fail, and the aircraft sank.

4. The occupants were not wearing life-jackets and did not have the opportunity to don their life-jackets before escaping from the aircraft.

Causes:

The aircraft was damaged when it struck a large bird.

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DE HAVILLAND DHC-3 MKI OTTER C-GRJB
ESCAPE LAKE, ONTARIO 8 mi SW
22 MAY 1988

REPORT NUMBER: 88-C0086 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1815 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,000	2,000
LAST 90 DAYS	100	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot/owner was using his float-equipped aircraft to conduct a 30-mile flight from his camp at Escape Lake, to Thunder Bay, Ontario. He had flown approximately eight miles when the aircraft engine began running rough, then lost all power. The pilot estimated that he could not reach a lake of suitable size and prepared for a forced landing in a swampy tree-covered area. During the descent, the pilot attempted to restart the windmilling engine using the fuel wobble pump. The engine sputtered to life, lost power, then restarted, and surged to high power just before impact. The aircraft struck trees, nosed into the ground, and both wings were torn from the fuselage. It then rotated through 180 degrees and came to rest on its left side. The pilot evacuated the aircraft and walked to a small lake, where he was rescued by another aircraft. The aircraft was badly damaged, but the pilot, who was wearing his shoulder harness, received only minor injuries.

The fuel system for this aircraft incorporates three fuel tanks, front, centre, and rear, located in the belly of the aircraft. Each tank is designed with a recessed sump in the bottom of the tank where water and other contaminants will collect. Each sump is equipped with an outflow line and a quick drain fitting. The outflow line provides fuel to the aircraft engine when the tank has been selected. The quick-drain fitting is provided to enable removal of water and other contaminants from the sump. If the sump is not drained prior to flight, water which collects in the sump is immediately accessible to the fuel system.

The front fuel tank had been filled at Thunder Bay prior to the flight to the campsite. The two other tanks were estimated to contain one or two inches of fuel each. No fuel was added at the campsite, and, prior to departure, the pilot checked the front tank sump and the delivery line strainer. He did not check the sumps for the centre and rear fuel tanks which had been near empty for a considerable period of time. Near empty fuel tanks are susceptible to the effects of condensation, resulting in water accumulation.

The fuel wobble return line was disassembled, and the fuel removed contained approximately one-third water. The fuel dispensing tanks at Thunder Bay were inspected, and the system provided clear, uncontaminated fuel.

During take-off and landing, the pilot operated the aircraft with the front fuel tank supplying fuel to the engine. He indicated that it was his habit to select one of the other aircraft fuel tanks in flight, to maintain the fuel level in the remaining tanks at a minimum. He could not recall if he had selected a second fuel tank during the occurrence flight but felt that he may have done so.

The aircraft was not equipped with an emergency locator transmitter (ELT), as required by regulation. While this had no bearing on the time required to rescue the pilot, the lack of an ELT may have had serious consequences under different circumstances.

The engine lost power because of water in the fuel system. The exact source of the water could not be determined; however, it is probable that the pilot selected one of the unchecked fuel tanks while in cruise flight. Water in the tank, formed as a result of condensation, was fed to the engine, causing the power loss. The pilot then reselected the front tank and actuated the wobble pump in an attempt to restart the windmilling engine. Pressure from the wobble pump and the engine driven fuel pump eventually purged the system and provided fuel to the engine. The engine then started and surged to high power.

CONCLUSIONS:

Findings:

1. The engine lost power because of water-contaminated fuel.

2. The centre and rear fuel tanks were not checked for water prior to the flight.

3. The aircraft was not equipped with an ELT, as required by regulation.

4. The pilot's use of shoulder harness minimized injury in the violent crash.

Causes:

The Canadian Aviation Safety Board determined that the pilot did not check the fuel tanks for water prior to the flight and, as a result, the engine stopped because of fuel contamination.

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LAKE LA-4 C-FQET
PHELPSTON, ONTARIO
22 MAY 1988

REPORT NUMBER: 88-O/0180 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1630 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	50
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The aircraft departed runway 25 at Phelpston, Ontario on a pleasure flight to Minden. After take-off, the pilot commenced a left turn in an attempt to clear the trees in a woodlot ahead. The left wing grazed the top of a tree, and the aircraft descended into the densely-wooded lot. The aircraft came to rest in an upright position approximately 250 feet from the end of the runway. Both occupants evacuated the aircraft.

The wind was from about 300 degrees at seven knots, and the temperature was estimated at 23 degrees Celsius. The 2,500- by 75-foot turf runway was dry, and the grass was less than one inch high. The wooded area began approximately 100 feet from the end of the runway, and the trees were 75 to 80 feet high. The runway was bordered on both sides with trees estimated to be 25 feet high.

The main wreckage path covered approximately 50 feet, and the right wing of the aircraft was found nearly straight up. There was no evidence of pre-crash aircraft engine or system failure or malfunction. Propeller damage to the left wing and fuselage indicates that the engine was delivering high power at impact.

The aircraft's take-off weight was calculated to have been 2,230 pounds, 170 pounds below the maximum allowable. Based on the Owner's Manual, after corrections were made for pressure altitude and temperature, the take-off run should have been about 800 feet. The aircraft had become airborne after a ground run of approximately 1,950 feet, apparently with the engine delivering full power. Further calculations showed that the aircraft would have climbed about 65 feet in the distance from lift-off to the 75- to 80-foot trees. The pilot had previously flown his aircraft from this airstrip, but it had not been at these high temperatures. He did not do any take-off performance calculations before the flight.

According to the information contained in the Owner's Manual, the aircraft had the performance to operate from this airstrip. However, given the distance remaining after lift-off, the aircraft did not have the performance necessary to climb above the trees at the end of the airstrip. For undetermined reasons, the take-off run was significantly extended, and, unaware that the aircraft did not possess the climb performance to clear the trees, the pilot elected to continue with the take-off. When the pilot saw that the aircraft was going to strike the trees, he initiated a left turn in an attempt to clear the trees. The aircraft stalled, and there was not sufficient altitude in which to recover.

CONCLUSIONS:

Findings:

1. The pilot's pre-flight planning did not include any take-off performance calculations.

2. The take-off run was significantly extended, and the pilot elected to continue with the take-off.

3. The aircraft was unable to clear trees at the end of the runway.

4. While attempting to avoid striking the trees, the pilot stalled the aircraft at an altitude which did not permit recovery.

Causes:
The aircraft's take-off run was significantly longer than expected, and the pilot failed to abort.

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REPUBLIC RC-3 SEABEE N6119K
HOWE SOUND, BRITISH COLUMBIA
25 MAY 1988

BRIEF NUMBER: 88-P0104 (Accident)
LOCAL TIME: 0720 PDT
OPERATION: Private Testing
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,500	125
LAST 90 DAYS	100	100

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was on a test flight in the amphibious aircraft following modifications to the instrument panel and the installation of new instruments and radios. While the aircraft was cruising at 600 feet above the waters of Howe Sound, heavy smoke appeared from behind the instrument panel. The pilot turned the master switch off, landed on the water, and disconnected the battery. While being towed in heavy seas, the aircraft took on water, and it was beached to prevent it from sinking.

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FLEET 80 CANUCK C-FEAV
GOUIN DAM, QUÉBEC 15 mi S
25 MAY 1988

BRIEF NUMBER: 88-Q0134 (Accident)
LOCAL TIME: 1630 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	200	110
LAST 90 DAYS	12	12

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

After rounding out at about two feet above the surface of the lake, the aircraft was struck by an updraft, a downdraft, and several strong gusts. The left float nosed down into the water, and the aircraft overturned. The left float and wing were damaged.

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CESSNA A185F SKYWAGON N93766
WASKAGANISH, QUÉBEC 18 mi E
27 MAY 1988

REPORT NUMBER: 88-Q0144 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1700 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot was landing his amphibious floatplane on the Pontax River to prepare a campsite for a proposed camping trip. On landing, the aircraft nosed over. The pilot and passenger evacuated the aircraft before it sank but were unable to recover any of their camping gear. Search and Rescue located the uninjured pair eight days later.

The weather at the time of the accident was reported to be adequate for visual flight rules (VFR) flight, with light winds. The pilot believed that he retracted the landing gear prior to landing; however, the gear was found locked in the extended position. The landing gear is under hydraulic pressure only during the extension or retraction cycle. Due to mechanical friction, the landing gear cannot lock either up or down except with hydraulic assistance.

Since the gear was found locked down, the pilot must have landed with the gear down and locked.

CONCLUSIONS:

Findings:
1. The pilot landed the amphibious aircraft on water with the landing gear in the extended position.

Causes:
The pilot did not carry out an adequate post-take-off and/or pre-landing check.

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CESSNA 180 SKYWAGON N9202
REFUGE COVE, BRITISH COLUMBIA
27 MAY 1988

REPORT NUMBER: 88-P0106 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1652 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,345	124
LAST 90 DAYS	69	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	1	-

HISTORY OF THE FLIGHT:

The pilot landed the float-equipped aircraft at Refuge Cove to refuel prior to continuing on to Butte Inlet on a camping and fishing trip. He had made this same flight several times previously. After refuelling the aircraft to capacity, the pilot attempted to take off downwind toward the open water of Desolation Sound, but the aircraft was not able to lift off before encountering the rough water outside the cove, and the pilot discontinued the take-off. The pilot then turned the aircraft around and began a take-off into wind toward the cove. After lifting off and climbing to about 35 feet above sea level (asl), the aircraft was observed in a steep right turn inside the cove. As the aircraft completed the 180-degree turn, the right wing and float hit the ground. The aircraft then crashed into a cabin on the shoreline and burned. The pilot was fatally injured, and the passenger was seriously injured.

PERTINENT INFORMATION:

At the time of the accident, there was an overcast ceiling at about 2,000 feet. Witnesses estimated that the wind was from the north over the hills that surround the cove, at about 20 mph.

Both the passenger and the pilot were wearing lap belts; shoulder harnesses were not installed. On take-off the passenger's seat was in the rearward position. Following impact, the passenger remained conscious but was unable to revive the pilot. The aircraft cabin filled with smoke, and the passenger exited, intending to return and rescue the pilot. While the passenger was outside the aircraft, the fuel ignited, creating an intense fuel-fed fire that consumed both the aircraft and cabin.

Local pilots, who know the topography of the island, reported that they never take off into the cove. If the wind is too strong from the north, they taxi their aircraft into a narrow channel to the northwest, thereby adding an extra 1,500 feet of take-off distance before entering the open waters of Desolation Sound.

ANALYSIS:

Although the pilot was familiar with Refuge Cove, he did not have comprehensive knowledge of the local topography. Consequently, he attempted an unsuccessful downwind take-off that had to be discontinued because of rough water. He then attempted to take off into the cove, but the performance of the aircraft was such that the aircraft was unable to climb in the descending air caused by the north wind blowing over the hills and into the cove. When the pilot made the steep right turn to avoid the hills, the aircraft could not maintain level flight and crashed.

Because the passenger's seat was in the aft position, she did not contact the aircraft structure during the crash, and she remained conscious. It is possible that a shoulder harness would have restrained the pilot during the crash and allowed him to escape with only minor injuries.

CONCLUSIONS

Findings:

1. The pilot attempted a take-off into a cove, and the aircraft was unable to climb in the descending air.

2. The pilot attempted a steep right turn to avoid the hills.

3. It was not possible for the aircraft to maintain level flight in the turn, and it hit the ground and crashed into a cabin.

4. The aircraft fuel ignited before the pilot could be evacuated from the aircraft.

5. The aircraft was not equipped with shoulder harnesses.

Causes:

The aircraft was unable to climb in the descending air, and the pilot initiated a hard right turn to avoid hills. The aircraft was unable to maintain level flight in the turn and crashed.

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CESSNA A185F SKYWAGON C-GZOP
CLAMPITT LAKE, ALBERTA
28 MAY 1988

BRIEF NUMBER: 88-W0094 (Accident)
LOCAL TIME: 1045 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	561	347
LAST 90 DAYS	15	9

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot of the float-equipped aircraft circled the lake to determine the wind direction and landing conditions. He made his approach from south to north using 20 degrees of flap and 80 knots airspeed. After touchdown and while slowing through 40 knots, the pilot realized the aircraft would not stop before reaching the shore; however, the remaining distance was not sufficient to take off again. The aircraft slid onto the shore, struck trees, and was substantially damaged.

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TAYLORCRAFT BC12D C-FZND
KAVANAGH LAKE, SASKATCHEWAN
04 JUNE 1988

BRIEF NUMBER: 88-C0100 (Accident)
LOCAL TIME: 1006 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	186	135
LAST 90 DAYS	27	27

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was landing on a lake that had areas of glassy water. During final approach, the pilot lost reference with the lake surface over a large patch of glassy water. The aircraft struck the water with the left pontoon and nosed over.

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CESSNA 185 SKYWAGON C-FEKG
LAKE NÉMÉGOUSSE, QUÉBEC
05 JUNE 1988

BRIEF NUMBER: 88-Q0146 (Accident)
LOCAL TIME: 1200 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	800	260
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The float-equipped aircraft was taxiing on the water in preparation for take-off. During a shallow right turn, the left float struck a submerged rock. The pilot increased power in an effort to free the aircraft, but there was a strong quartering tail wind, and the aircraft capsized and sank; the pilot was not injured.

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PIPER PA-11 C-FPRU
AMOS, QUÉBEC
12 JUNE 1988

BRIEF NUMBER: 88-Q0153 (Accident)
LOCAL TIME: 0610 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	310	116
LAST 90 DAYS	19	19

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The aircraft owner and his passenger were taking off on a fishing trip. There was no wind, and the water was glassy. Just after take-off, the pilot levelled the aircraft off in an attempt to gain speed. The right float struck the water, followed by the left float, and the aircraft overturned. The aircraft was substantially damaged; no one was injured.

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CHAMPION 7EC C-FRMQ
REYNOLDS LAKE, ONTARIO 1 mi N
12 JUNE 1988

BRIEF NUMBER: 88-O/0215 (Accident)
LOCAL TIME: 1830 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	320	132
LAST 90 DAYS	10	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot, who was familiar with the lake, was departing after a fishing trip. He taxied for take-off to the southeast corner of the lake, which is approximately three-quarters of a mile long. There was a cross-wind approximately 50 degrees to the left of the take-off path at about 18 knots, and the temperature was about 29 degrees Celsius. During the initial climb, the aircraft entered a downdraft while climbing over rising terrain. Higher terrain on either side precluded a turn in either direction, so the pilot continued to raise the nose of the aircraft until the aircraft stalled and the left wing dropped. The aircraft descended into trees, coming to rest in an upright position less than one mile from the departure point.

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AERONCA 7AC CHAMPION C-FYQM
LAC CULOTTE, QUÉBEC
01 JULY 1988

REPORT NUMBER: 88-Q0186 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1530 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	717	220
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on a cross-country visual flight rules (VFR) flight between Shipshaw and Lac Gagnon, Québec. During the trip, weather conditions deteriorated, and fog settled over the area. The pilot landed on Lac Culotte and took off after the fog had cleared. Just after lift-off, the aircraft lost altitude and settled to the surface of the lake. The pilot continued the take-off, and, after an extended run, the aircraft became airborne, but the rate of climb was low. When the pilot saw that he was getting too close to a hill at the edge of the lake, he reduced power and rejected the take-off. The aircraft landed hard on the lake, the right wing and landing gear struts failed, and the airplane came to rest nose-down in the water. The pilot was seriously injured but managed to exit the wreckage through the left rear window.

The owner/pilot was qualified and experienced on the aircraft type. The aircraft was airworthy, and the weight and centre of gravity were within the prescribed limits.

Weather conditions were suitable for VFR flight at the time of the first take-off. However, approximately 45 minutes into the flight, the pilot was forced to land on the lake because heavy fog was quickly settling over the area. The fog had cleared when the pilot decided to resume the flight.

There was about 4,000 feet of take-off distance available, and there were hills rising to 250 feet at the edge of the lake in the direction of take-off. Winds were gusting from the east at an estimated 15 to 20 miles per hour, and there was turbulence over the lake. The aircraft took off into wind, but it was forced to the surface of the lake by a downdraft. Because of the turbulence and downdrafts, the take-off run required was increased. As the aircraft was at low altitude and did not have enough power to increase its rate of climb and clear the hill ahead, the pilot rejected the take-off. When the pilot rejected the take-off, there was approximately 500 feet of landing distance remaining. The aircraft struck the water hard, causing the right wing and landing gear struts to collapse.

CONCLUSIONS:

Findings:
1. The take-off distance required was increased by turbulence and downdrafts.

2. After take-off, aircraft power was insufficient to increase the rate of climb and clear the hill.

3. The aircraft landed hard on the water and was damaged.

Causes:
The pilot rejected the take-off and the aircraft was substantially damaged during the hard landing.

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DE HAVILLAND DHC-2T MKIII BEAVER C-FPSM
AHMIC LAKE, ONTARIO
03 JULY 1988

REPORT NUMBER: 88-O/0243 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1550 EDT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,015	6
LAST 90 DAYS	136	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot had successfully completed 10 or 12 landings in other parts of the large lake. He flew the aircraft to the southeast end of the lake and carried out a successful touch-and-go landing and initiated another circuit and approach to land in the same area. Following touchdown, the right outer wing struck the water, and the aircraft nosed over and began to sink. The pilot was able to escape from the aircraft before it submerged.

The pilot held a valid Airline Transport Pilot Licence and was acquiring solo time in order to obtain a float endorsement. He had completed 6.1 hours of time on the aircraft, 3.1 of this solo time.

The pilot had not reported any difficulty with the previous landings; prior to this touchdown, he had to adjust his approach slightly to the right of his intended landing path to avoid water traffic. The pilot reported that the wind was blowing from about 330 degrees at 5 to 10 knots which would have resulted in a 20-degree crosswind from the right of his landing path. Weather observations taken at Muskoka Airport and North Bay Airport at about the time of the occurrence reported the wind direction and speed to be 280 degrees true at 10 gusting to 15 knots and 240 degrees at nine knots respectively. Ahmic Lake is equidistant from these two airports, that is about 35 miles from each. Using these reported winds, this would result in a cross-wind component of between 30 and 70 degrees from the left. Damage to the aircraft's right wing and float suggested that, on touchdown, the aircraft may have been drifting to the right, resulting in the right float ploughing into the water, followed by the right wing striking the surface of the lake.

Careful examination of the damaged right float confirmed that there was no evidence of collision with a floating or submerged object. The float bow had been driven upwards and inwards, resulting in overload failures in the float structure ahead of the spreader strut attachments. This damage pattern is consistent with that which would result from hydrodynamic forces acting on the float structure at touchdown with the aircraft in in a slightly nose-down attitude and drifting to the right. Damage to the right wing was also due to water impact. All float attach brackets and struts had failed under overload conditions when the aircraft nosed over.

The pilot had limited experience on float-equipped aircraft and may not have recognized drift or wind direction prior to touchdown. The lake was large enough for an into wind landing.

No faults were found in the aircraft's control systems or float structure which would have contributed to the accident.

The damage pattern indicated that the aircraft touched down in a slightly nose-down attitude, drifting to the right. Hydrodynamic forces acting on the right float following touchdown resulted in the right outer wing striking the water. The aircraft, as a result, nosed over and sank.

CONCLUSIONS:

Findings:

1. The aircraft landed in cross-wind conditions.

2. On touchdown, hydrodynamic forces acting on the right float resulted in the right wing striking the water, causing the aircraft to nose over.

3. All failures found in the float struts and bow structure of the right float were the result of overload conditions applied to the right float on contact with the water.

Causes:

The landing technique was inappropriate for the existing conditions.

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PIPER PA-12 C-FLFY
RIVIÈRE-AUX-EAUX-MORTES, QUÉBEC
09 JULY 1988

BRIEF NUMBER: 88-Q0194 (Accident)
LOCAL TIME: 1630 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	126	70
LAST 90 DAYS	21	21

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot had refuelled the aircraft, giving the aircraft an endurance of five and one-half hours. After more than four hours of flight and several stops, the pilot was near his destination when a storm forced him to alter course. The detour was longer than expected, and the pilot, realizing that he might run out of fuel, decided to land. He reduced power and was beginning the descent when the engine stopped because of fuel exhaustion. The pilot force-landed the aircraft on a narrow river bordered by trees. The aircraft was substantially damaged, but the pilot and passenger were not injured.

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CESSNA 180A SKYWAGON C-FKJD
RIVIÈRE-DES-PRAIRIES, MONTRÉAL, QUÉBEC
13 JULY 1988

BRIEF NUMBER: 88-Q0195 (Accident)
LOCAL TIME: 1740 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	630	136
LAST 90 DAYS	43	43

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The float-equipped aircraft had taken off and was about 10 feet above the water when the left wing stalled. The left wing then struck the water, and the aircraft nosed down into the water, then emerged and came to rest on its floats. The pilot and passenger exited the aircraft without injury.

The aircraft took off in a southwesterly direction in light winds. In preparation for the take-off, the pilot raised the float rudders, applied full power, selected 20 degrees of flap, and held the elevator control back until he was on the step, then eased the column forward. The aircraft was at a speed of about 60 miles per hour when it lifted off from the water. The pilot gradually retracted the flaps, and the aircraft stalled. He attempted to increase the speed by lowering the nose, but the left wing struck the water. As the left door was jammed by the force of the impact, the occupants exited the aircraft via the right door.

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CESSNA TU206G STATIONAIRE C-GDER
ARTHURLIE BAY, LAKE ROSSEAU, ONTARIO
19 JULY 1988

BRIEF NUMBER: 88-O/0273 (Accident)
LOCAL TIME: 1815 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,000	2,500
LAST 90 DAYS	35	35

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot took off in the amphibious aircraft from the Muskoka, Ontario Airport and selected the landing gear and flaps up. The red low-voltage light illuminated, and all electrical power was lost. The pilot turned off the master switch to conserve the battery power and observed that the flaps were in the up position, but he did not confirm the position of the landing gear. After a short local flight, the pilot prepared to land on the water in Arthurlie Bay, Lake Rosseau. On final approach, the pilot turned the master switch on to lower the flaps. The low-voltage light illuminated again, and, after the flaps were down, the pilot turned the master switch off. The landing gear handle was in the UP position; however, the pilot did not confirm the position of the landing gear prior to landing. When the aircraft touched down, it immediately nosed over and sank. The pilot was able to egress from the inverted aircraft and observed that the landing gear was in the down position.

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LAKE LA-4-200 BUCCANEER C-FBFB
TROIS-RIVIÈRES AIRPORT, QUÉBEC
22 JULY 1988

REPORT NUMBER: 88-Q0207 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1515 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	600	350
LAST 90 DAYS	39	39

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot, who was on a pleasure flight, landed at Trois-Rivières Airport on runway 23. Touchdown was normal, and, during the roll-out, the right landing gear collapsed. The aircraft slid 400 feet on its keel and came to rest 1,600 feet from the runway threshold.

Weather conditions at the time of the occurrence were favourable for visual flight, and the asphalt runway was smooth and dry. The aircraft weight and centre of gravity were within the prescribed limits.

Examination of the landing gear showed that the system required 1,300 pounds per square inch (psi) of hydraulic pressure to operate normally. It was also shown that, with the aid of a remote hydraulic pump, with hydraulic pressure below 300 psi, and with the landing gear indicating DOWN and LOCKED, the main gear can easily be unlocked with light lateral pressure. The flap and trim systems are activated by the same hydraulic system.

On reaching cruise altitude, the circuit-breaker for the fuel booster pumps should be pulled. The pilot stated that he mistakenly pulled the hydraulic pump circuit-breaker, which is located immediately beside the circuit-breaker for the fuel booster pump.

With the hydraulic pump circuit-breaker pulled, hydraulic pressure decreased when the flap and trim systems were activated in preparation for the approach. Hydraulic pressure decreased to a point where there was insufficient pressure to keep the landing gear down and locked, despite the GEAR DOWN and LOCKED indication, and the right landing gear collapsed during the roll-out.

CONCLUSIONS:

Findings:

1. A hydraulic pressure under 300 psi is insufficient to keep the main landing gear locked, even though GEAR DOWN and LOCKED may be indicated.

2. The pilot accidentally pulled the hydraulic pump circuit-breaker instead of the fuel booster pump breaker.

3. The landing gear collapsed during the roll-out because the hydraulic pressure was too low.

Causes:

The pilot accidentally pulled the hydraulic pump circuit-breaker, causing a drop in hydraulic pressure below the level required to keep the landing gear locked.

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CESSNA U206G STATIONAIR C-GVLK
RIVIÈRE-DES-PRAIRIES, MONTRÉAL, QUÉBEC
18 AUGUST 1988

BRIEF NUMBER: 88-Q0236 (Accident)
LOCAL TIME: 1600 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	516	4
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot did a reconnaissance flight over the Rivière-des-Prairies water aerodrome. The wind was favourable for an approach in a northeasterly direction. On short final, the pilot made a left-hand turn to adjust his alignment, and the aircraft struck some unmarked wires. The pilot immediately applied full power; the wires broke, and the pilot managed to maintain control of the aircraft and land. No one was injured.

The sun was behind the aircraft when the accident occurred. The pilot did not see the wires until the last second. Prior to take-off, he did not consult the flight supplement listing the floatplane bases in Québec. This publication indicates that there are electrical wires half a nautical mile upstream from the dock of the Rivière-des-Prairies water aerodrome.

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CESSNA A185E SKYWAGON CF-ZXU
PUSLINCH LAKE, ONTARIO
27 AUGUST 1988

BRIEF NUMBER: 88-O/0343 (Accident)
LOCAL TIME: 1150 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,000	1,700
LAST 90 DAYS	N/A	36

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot took off in his amphibious aircraft from a hard-surface runway at Waterloo-Guelph Regional Airport and flew about six miles to Puslinch Lake where he landed on the water. On touchdown, the aircraft nosed over.

The pilot had not retracted the landing gear after take-off and landed with it extended.

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CESSNA 185 SKYWAGON C-GZVK
GOOSE BAY, BRITISH COLUMBIA 5 mi NW
02 SEPTEMBER 1988

REPORT NUMBER: 88-P0202 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1105 PDT
OPERATION: Private Business
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,150	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	3	-	-

HISTORY OF THE FLIGHT:

Prior to departure from Vancouver, British Columbia, the aircraft's fuel tanks were filled and approximately 60 pounds of baggage was loaded on board. The Cessna 185, with the pilot and three passengers aboard, then departed at approximately 0900 PDT for the flight to a fishing camp on Rivers Inlet, British Columbia. The aircraft was observed as it arrived over the fishing camp at 1100 PDT and completed a counterclockwise circle overhead. Although there was fog covering the trees on the shore, the aircraft remained visible throughout the turn. As the aircraft began the second circle, the engine became silent for approximately two seconds and then resumed a normal sound. Halfway through the turn, as the aircraft approached the end of the bay, the engine noise faded again. The attitude of the aircraft was then observed to change suddenly from level flight to steep nose-down, and the aircraft began to rotate to the left. It then struck a rocky outcrop on the shore, in a near vertical attitude, destroying the aircraft and fatally injuring the pilot and passengers.

PERTINENT INFORMATION:

The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The weight and centre of gravity were within the prescribed limits.

On the morning of the occurrence, the bay was obscured in fog. By 1100 PDT, the fog had lifted, but fog patches remained in the trees surrounding the bay. Vertical visibility through the patchy fog was reported as good as was the visibility down the bay. Outside the bay, the fog bank obscured the water surface and islands.

The bay sheltering the fishing camp was approximately 1,200 metres long and 150 metres wide. It was occasionally used as a landing area when the fog bank obscured Rivers Inlet. The rocky sides of the bay rise steeply to approximately 100 feet above sea level (asl) and are tree lined.

The aircraft struck a rock outcrop at the southern most tip of the bay. The front six feet of both floats were crushed and bent slightly to the left, indicative of a nearly vertical descent onto the rocks. Both floats were torn from the aircraft. The aircraft's tail section was buckled just aft of the passenger cabin and was thrown to the right. The passenger cabin was destroyed, and all seats were torn from the mounts.

Both the left and right wings were torn from the aircraft with the leading edge of both wings crushed rearward. The engine mounts failed on impact, and one blade had broken away from the propeller. The engine throttle was pulled rearward approximately three inches and bent at that setting, indicating a low power setting on impact. The propeller control was pulled rearward and bent at a setting corresponding to a fine pitch setting.

The flap selector lever was broken from its mount; however, damage to the flaps and flap system is indicative of a flaps-up or minimum-flap selection.

The engine (Continental IO-520D) was recovered and disassembled. Although there was impact damage, there was no visible evidence of any pre-impact defect that would have caused a loss of power. Damage to the propeller was consistent with engine power at impact. The fuel system was examined, and there was no evidence of a pre-existing problem or water in the fuel.

ANALYSIS:

All physical evidence observed at the accident site indicated that the engine was producing power consistent with the throttle setting observed. Since there were no discrepancies noted when the engine was disassembled, the reported sound variations can only be attributed to power variations as the pilot manipulated the engine controls in preparation for landing. The reported "unusual" engine sound possibly resulted from normal power variations reverberating within the narrow rock-lined bay.

The reported visibility was such that the pilot could see vertically through the fog, while lateral visibility was restricted. Consequently, the pilot would have had to keep the aircraft close to the landing area, flying at a slow airspeed so that he could maintain visual contact with the bay and complete a landing. As the aircraft approached the end of the bay, the pilot would have had to reduce power and initiate a hard left turn to align the aircraft with the landing area in the bay. At that point the pilot, for reasons that could not be determined, lost control of the aircraft, and it descended almost vertically onto the shoreline of the bay.

CONCLUSIONS:

Findings:

1. Patchy fog reduced horizontal visibility but did not restrict vertical visibility.

2. The aircraft weight and centre of gravity were within limits.

3. The engine was operating normally at impact.

4. The pilot lost control of the aircraft.

Causes:

Fog patches restricted horizontal visibility, and the pilot had to fly the aircraft close to the edge of the bay. As he circled for landing, he lost control of the aircraft. The reason for the loss of control could not be determined.

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PIPER PA-18-150 SUPER CUB C-FCLL
MINTO LANDING, YUKON 8 mi NW
04 SEPTEMBER 1988

REPORT NUMBER: 88-W0202 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1930 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	600	200
LAST 90 DAYS	45	45

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	1	-

SUMMARY REPORT:

The pilot of the float-equipped aircraft was on a trip from Whitehorse, Yukon to Dawson City, Yukon. Following an en-route visit at a remote location on the Yukon River, the pilot made a low climbing turn over bystanders, and the aircraft descended into the trees. The pilot and passenger sustained serious facial injuries.

The area forecast predicted moderate to severe turbulence below 14,000 feet in the Whitehorse and Dawson regions, with moderate mechanical turbulence below 6,000 feet. The pilot and a witness reported gusty surface winds from the south at 20 to 30 mph at the time of the accident. The pilot did not obtain a weather briefing prior to departure from Whitehorse.

Following the en-route stop, the pilot took off downwind, turned, and flew back up the river. Three bystanders were observing the departure from the top of a 50-foot-high river bank. When the pilot spotted the onlookers, he entered a steep climbing left turn downwind and passed almost directly over them. During this manoeuvre, he encountered turbulent air over the river bank, and the aircraft stalled. The aircraft contacted 40-foot high trees and descended almost vertically to the ground.

The pilot stated that the aircraft was about 200 feet above the ground when he began the turn; however, witness statements indicated that the aircraft was substantially lower. When the aircraft stalled during the turn, the pilot maintained full throttle and held the stick fully aft because he did not have sufficient altitude to lower the nose and recover.

The emergency locator transmitter (ELT) did not activate because it had been temporarily stowed in a pocket behind the pilot's seat and had no antenna attached. The aircraft was at gross weight; it was not equipped with a stall warning device, and shoulder harnesses were not installed.

The aircraft stalled because the pilot did not maintain adequate airspeed for the circumstances. The stall speed was relatively high because of the weight of the aircraft and the aircraft's steeply banked attitude. Because of the turbulent conditions, the pilot had little warning of the impending stall; the fact that the turn was downwind was a contributing factor. After the aircraft stalled, the pilot did not have sufficient altitude to recover, and the aircraft descended into the trees.

Had shoulder harnesses been available and worn, the injuries sustained by the pilot and passenger would have been reduced.

CONCLUSIONS:

Findings:

1. The pilot attempted a steep climbing downwind turn at low altitude in gusty wind conditions.

2. The aircraft stalled, and the pilot did not have sufficient altitude to recover.

3. The ELT did not function because it was not properly installed in the aircraft, nor was the antenna attached.

4. The aircraft was not equipped with shoulder harnesses.

Causes:
The aircraft stalled because the pilot did not maintain adequate airspeed while turning at low altitude.

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CLUB CHASSE ET PÊCHE MONTAGNAIS INC.
MAULE M5-235C C-GXIH
LAKE OTELNUK, QUÉBEC
7 SEPTEMBER 1988

BRIEF NUMBER: 88-Q0261 (Accident)
LOCAL TIME: 0945 EDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	165	94
LAST 90 DAYS	75	75

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was doing maintenance work on an outfitter's lodge. Immediately after the float-equipped aircraft took off in a northerly direction, and while at a height of about 15 feet, a strong gust of wind forced the aircraft into an uncontrollable right-hand roll. The right wing tip struck the water, and the aircraft swung violently and sank. The pilot was uninjured and exited the aircraft immediately.

The pilot indicated that at the time of the incident, the winds were from the north at 15 gusting to 20 knots. He had selected full flaps to improve the airplane's take-off performance. After take-off, however, he was unable to retract the flaps to 15 degrees as recommended by the manufacturer.

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STINSON 108 C-FJAE
LAKE RAPIDES, QUÉBEC
16 SEPTEMBER 1988

BRIEF NUMBER: 88-Q0268 (Accident)
LOCAL TIME: 1700 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	80	20
LAST 90 DAYS	24	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCONSTANCES

The pilot taxied out on the lake, completed the run-up, and began the take-off. He had selected two notches of flaps, and the aircraft took off at a speed of 65 miles per hour. The pilot then lowered the nose to increase speed. When the aircraft reached the Lake Rapides Pass, it encountered downdrafts. One float touched down on the lake, and the aircraft made a hard water landing. Only the float fittings were damaged.

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AERONCA 7AC CHAMPION C-FFMC
LAKE TREMBLAY, QUÉBEC
24 SEPTEMBER 1988

BRIEF NUMBER: 88-Q0281 (Accident)
LOCAL TIME: 1600 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	124	45
LAST 90 DAYS	23	23

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The float-equipped aircraft was taxiing into take-off position on Lake Tremblay on the lee side of an island, where it would be sheltered from the wind. The pilot initiated a turn into the wind, but he lost directional control, and the aircraft swung violently. The aircraft turned sideways into the wind, and the left float rose and the right wing dug into the water. The aircraft overturned, then sank. The pilot and passenger were uninjured and swam ashore.

According to the pilot, a very strong west wind was blowing directly from the rear of the aircraft. As the impact was light, the emergency locator transmitter (ELT) did not activate. Four days later, the two occupants dove into the lake and retrieved the ELT, and the pilot activated it manually. They were subsequently rescued by a Canadian Armed Forces helicopter.

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CONSOLIDATED AERONAUTICS INC.
LAKE LA-4-200 C-GGCH
BUTTONVILLE AIRPORT, ONTARIO
25 SEPTEMBER 1988

REPORT NUMBER: 88-O0387 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2021 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	365	199
LAST 90 DAYS	43	43

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The pilot and passengers were returning to Buttonville, Ontario from a weekend at Weslemkoon Lake, Ontario. Night visual meteorological conditions prevailed, and the winds were light from the south. While on left base for runway 15, the aircraft struck the top of at least one tree, at approximately 18 feet above ground level. The pilot turned onto final, and, seconds later, the aircraft struck a low embankment, 64 feet short of the threshold of runway 15, shearing off the left main gear. The aircraft bounced twice on the runway, left the paved area approximately 250 feet from the threshold, and entered a wet, grassy area to the east. The aircraft slid, damaging the nose gear and collapsing the right main gear before coming to a stop upright, facing east.

Runway 15 was equipped with edge, threshold, and end lights, and a visual approach slope indicator system; all were turned on at the time of the occurrence.

The pilot was familiar with the aircraft and with the airport but reported that he had difficulty distinguishing the runway lights from the lights surrounding the airport. He stated that the airspeed was low while on a left base for the runway prior to striking the tree. He reported that, after the aircraft struck the tree, he increased the power to regain altitude, and, after a series of oscillations, he turned onto final where the aircraft struck the ground short of the threshold.

The aircraft weight and balance were within limits at the time of the accident, and there were no reported control problems or engine irregularities.

The pilot experienced difficulty in distinguishing the runway lights from the surrounding lights and, as a result, misjudged his approach and positioned the aircraft on an extremely low, left base to runway 15. After striking the tree, the pilot attempted to continue with the approach and landing rather than reject the attempt and try again, and he lost control of the aircraft.

CONCLUSIONS:

Findings:

1. The pilot had difficulty distinguishing the runway lights from the lights surrounding the airport.

2. The pilot allowed the aircraft to descend too low on left base.

3. The aircraft struck trees while on base leg.

4. The pilot lost control of the aircraft when it struck the ground short of the runway.

Causes:

The pilot had difficulty distinguishing the runway lights from the surrounding lights, misjudged his approach, and allowed the aircraft to descend too low.

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PIPER J3 CUB C-FNPC
PICKLE LAKE, ONTARIO
30 SEPTEMBER 1988

BRIEF NUMBER: 88-C0199 (Accident)
LOCAL TIME: 1000 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	417	243
LAST 90 DAYS	25	25

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot landed the aircraft on the rough, choppy lake, and, as the aircraft slowed, the left front float strut connector broke. The float gear collapsed, and the nose of the aircraft came to rest on the forward spreader bar. There appeared to be internal corrosion at the fracture point of the strut.

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RISK OF COLLISION BETWEEN: VICKERS-ARMSTRONG VC-10 ASCOT 2696 and TWO MAINTENANCE VEHICLES GANDER INTERNATIONAL AIRPORT, NEWFOUNDLAND

30 MAY 1988

REPORT NUMBER: 88-A0138 (Incident)
LOCAL TIME: 1120 NDT
INFORMATION SOURCE: Field Investigation

VICKERS-ARMSTRONG VC-10 ASCOT 2696

OPERATOR: Royal Air Force (United Kingdom)
OPERATION: State
DAMAGE: None
PILOT LICENCE: Military (United Kingdom)

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	N/A	N/A	N/A	N/A
LAST 90 DAYS	N/A	N/A	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	9
PASSENGERS	-	-	116

MAINTENANCE VEHICLES STAFF 24 and STAFF 39

OPERATOR: Department of Transport
OPERATION: Runway Maintenance
DAMAGE: None

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	8
PASSENGERS	-	-	-

SUMMARY REPORT:

The approach to runway 04 was not visible from the tower because of reduced visibility in light rain and fog. Gander Centre informed the tower controller that Ascot 2696 was on the approach. Four minutes later, the controller cleared two maintenance vehicles, Staff 24 and Staff 39, to proceed with inspection work on runway 04/22. While the two vehicles were still on the runway, the controller cleared Ascot 2696, which was inbound to runway 04, to land.

As a reminder that the vehicles were on the runway, the controller had made a note on the traffic sheet and had switched on the controller's warning light used to indicate that a vehicle is on the runway.

The controller was transmitting on both tower and ground frequencies at the same time. The vehicle operators heard the controller talking to Ascot 2696 and knew that the aircraft was on approach to runway 04. They anticipated being instructed to clear the runway and were preparing to do so when they heard the controller clear the aircraft to land. After he heard the landing clearance, the driver of Staff 24 called on ground frequency and, shortly after, advised the controller that Staff 24 was clear but that Staff 39 was still on the runway. Staff 39 reported clear soon after.

Just before Staff 24 made his call, the controller remembered that the vehicles were on the runway. He determined that there was sufficient time for the vehicles to clear the runway before the aircraft landed, so he allowed the aircraft to continue. The aircraft landed about 50 seconds after the vehicles had cleared the runway.

Traffic was light, and one controller was working both tower and ground positions. Another controller was on duty and was in the tower; however, he was taking his lunch break and was not working at the time of the occurrence. Also in the tower were two off-duty controllers who are involved in glider operations at the airport. They were discussing possible changes to the glider operation, some of which had been suggested by the working controller.

When the controller became involved in the discussion about the glider operation, he was distracted from his control duties and did not monitor the Runway Occupancy Indicator System to ensure that the active runway was clear. The controller forgot about the vehicles, and, when Ascot 2696 called by the outer marker on final, the controller cleared the aircraft to land while the vehicles were on the runway.

CONCLUSIONS:

Findings:

1. The controller was distracted from his duties.

2. The controller forgot that the vehicles were on the runway, and cleared the aircraft to land.

3. The controller did not monitor the Runway Occupancy Indicator System to ensure that the active runway was clear.

Causes:
The controller forgot that the vehicles were on the runway.

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MANITOBA GOVERNMENT AIR SERVICES
CANADAIR CL 215 C-GYJB
BLACK ISLAND, MANITOBA
29 JUNE 1988

BRIEF NUMBER: 88-C0138 (Incident)
LOCAL TIME: 1930 CDT
OPERATION: State
DAMAGE: None
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	20,000	1,600
LAST 90 DAYS	200	200

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft was engaged in fire-fighting activities and was picking up water when the left engine failed. The investigation by the operator determined the primary cause as a connecting rod failure.

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OKANAGAN HELICOPTERS LTD.
BELL 206B III JETRANGER (Helicopter) C-GIXS
LAIB CREEK, BRITISH COLUMBIA
28 FEBRUARY 1988

REPORT NUMBER: 88-P0034 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1427 PST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	7,300	7,050
LAST 90 DAYS	115	115

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The helicopter had just reached a cruise speed of 90 knots when the engine suddenly failed. The pilot autorotated the helicopter into a small snow-covered clearing where it received substantial damage when the rotor blades struck the tail boom; the pilot and passenger escaped injury.

During an examination of the engine (Allison 250-C20B), the idler gear (Part Number 6824977) and its retaining bolt were found lying in the bottom of the gearbox. The idler gear is part of the gear train which drives the fuel pump. Allison Commercial Engine Bulletin (CEB) Number 1147, issued in 1979, specifies that a self-locking insert be installed to help prevent the idler gear bolt from working loose. This CEB warned "it is important that this CEB is complied with because engine failure could occur without prior warning if insert of idler gear wears loose, thereby relieving torque on bolt, bolt falling out, and idler gear becoming unmeshed, resulting in an inflight shut down."

The gearbox component records for the engine indicate that CEB 1147 was complied with prior to October 1982. However, the inserts removed from the gearbox cover after the accident were not the self-locking types as called for in the bulletin. The reason the inserts had not been installed could not be determined.

Lack of a self-locking insert in the engine gearbox cover allowed the bolt to lose torque and resulted in wear of the locking tab on the keyway washer installed under the bolt head. When the bolt loosened, the idler gear unmeshed and disengaged the fuel pump gear from the drive train, causing the engine to stop.

CONCLUSIONS:

Findings:

1. Allison Commercial Engine Bulletin 1147, which called for self-locking threaded inserts for the power train idler gear bolts, had not been complied with, although the engine log book records indicated that it had been.

2. Loss of torque on the idler gear bolt allowed the locking tab on the keyway washer to wear down, loosening the idler gear attachment bolt. The idler gear moved out of position and disengaged the fuel pump gear from the drive train, causing the engine to stop.

3. The helicopter was damaged in the autorotational landing.

Causes:
The self-locking threaded inserts for the power train idler gear bolts were not installed.

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GREAT SLAVE HELICOPTERS LTD.
HUGHES 369D (Helicopter) C-GXON
LONG TOM LAKE, NORTHWEST TERRITORIES
17 APRIL 1988

REPORT NUMBER: 88-W0066 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1310 MST
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	13,500	4,500
LAST 90 DAYS	190	140

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The helicopter had been chartered to move a diamond drill from the base camp to a drill camp. After completing the drill move and while on final approach for a landing at base camp, the pilot heard a loud noise, followed by a loss of tail rotor control, and he carried out an autorotational landing. The pilot had no recollection of a tail rotor strike during the flight. The on-site examination showed that the tail rotor drive shaft had failed from torsional overload.

The tail rotor drive shaft was examined at the Canadian Aviation Safety Board Engineering Laboratory in Ottawa, and the tail rotor, the tail rotor transmission, and associated equipment were examined in a Hughes authorized service/repair facility in Calgary. Both of these examinations of the tail rotor drive shaft suggested that the failure was the result of sudden stoppage of the shaft, probably because of a tail rotor blade strike. The examination of the tail rotor blades showed no damage; however, the tail rotor fork bolt was bent in the direction of travel opposite to that of the tail rotor blades. Several teeth on the drive gear within the tail rotor transmission were damaged. The tension/torsion strap was twisted suggesting a sudden stoppage of the tail rotor blades while under power.

Although the pilot did not report having had a tail rotor strike and there was no evidence of a strike on the tail rotor blades, the damage to the tail rotor drive components suggested that the tail rotor had been stopped suddenly by a tail rotor strike.

CONCLUSIONS:

Findings:
1. The tail rotor drive shaft failed from torsional overload, probably as a result of being stopped suddenly.

2. The tail rotor fork bolt was bent in a manner to suggest that the tail rotor blades had been stopped suddenly while under power.

3. Several teeth on a drive gear in the tail rotor transmission were damaged and the tension/torsion strap was twisted, suggesting a sudden stoppage of the tail rotor while under power.

Causes:
The tail rotor drive shaft failure was caused by a sudden stoppage of the tail rotor blades while under power, most likely as a result of a tail rotor strike.

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AGROTORS CANADA LIMITED
HUGHES 269C (Helicopter) C-GURH
MADOC, ONTARIO 14 mi NNW
27 MAY 1988

REPORT NUMBER: 88-O/0194 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0918 EDT
OPERATION: Flying School Training
DAMAGE: Destroyed
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	78	70
LAST 90 DAYS	68	60

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

On 27 May 1988, at 0836 eastern daylight time (EDT), the student pilot departed Kingston, Ontario in the Hughes 269C helicopter. The pilot was on a solo cross-country training flight to Pembroke, Ontario via Bancroft, Ontario in visual meteorological conditions (VMC). At 0917 EDT, while en route, the pilot made a distress call which was received by the Toronto Flight Service Station. The pilot stated that the engine had failed and that she was entering an autorotation for an emergency landing. No other radio transmissions were received from the pilot, and no emergency locator transmitter signals (ELT) were received.

At 0927 EDT, an aerial search was initiated involving both civilian and military aircraft. The helicopter was located the next day at 1805 EDT, about 43 nautical miles from Kingston along the planned flight track. The accident site was in a heavily wooded river valley at about 850 feet above sea level. The pilot was fatally injured in the accident.

PERTINENT INFORMATION:

The pilot had commenced her helicopter flight training on 01 February 1988, and all of her dual flight instruction had been with the company chief flying instructor. She had satisfactorily completed an autorotation and emergency review flight with her instructor on 13 April 1988 in a Hughes 269C helicopter and had performed practice touchdown autorotations in a Bell 206 helicopter on 18 May 1988. The pilot was current, qualified, and authorized to act as pilot-in-command on this solo training flight.

The flight was conducted in accordance with visual flight rules (VFR) and navigation procedures. The terrain between Kingston and Bancroft, Ontario, was sparsely inhabited woodland with numerous streams, small lakes, and rock outcrops. There were few areas en route that were suitable for a forced landing.

The helicopter descended through the trees almost vertically struck the ground in a level attitude with no forward speed. The helicopter then rolled onto its left side, rupturing the left fuel tank. A post-impact fire destroyed the helicopter and the ELT.

The engine (Lycoming HIO-360-01A) suffered severe impact and post-impact fire damage. A portion of the rear of the crankcase was broken and melted, exposing a broken crankshaft. The engine had been overhauled and installed in the helicopter on 12 May 1988. It had operated normally for about 36 hours prior to the accident. When the engine was overhauled, diametric measurements of the crankshaft indicated it was worn beyond the standard journal size limits. A magnetic particle inspection (MPI) was done before it was polished to the 0.003 inch undersize limit. After the crankshaft was polished, another MPI was done, and the crankshaft was then reinstalled in the engine. The crankshaft, part number (P/N)77850), was manufactured with a non-vacuum remelted steel and initially installed in the engine on 20 February 1978. After 01 April 1978, crankshafts used in this engine were manufactured with vacuum remelted steel.

Examination of the crankshaft revealed that it had failed in fatigue at the web-to-journal fillet radius of the number four connecting rod journal. The fatigue failure had progressed in a high-cycle, low-stress mode through most of the fracture surface. No machining marks nor sharpness in the radius area were observed, and there was no evidence of a lack of lubrication. Inclusions were present in the journal fillet area adjacent to the origin site. In addition, a continuous lip along the fracture site was observed. The exact nature of the fatigue origin was not determined; however, with the exception of the inclusions, no other possible stress raisers were evident which could have contributed to the failure.

The helicopter was operated in accordance with Department of Transport regulations for this training flight.

ANALYSIS:

The crankshaft, which was manufactured with non-vacuum remelted steel, contained inclusions which are small oxide or sulphide particles produced during the steel-making process. The crankshaft failed in fatigue at the web-to-journal forward fillet radius of the number four connecting rod journal. The presence of a continuous lip along the fracture site of the crankshaft suggests the fatigue initiated from a surface defect. It is possible that one or more of these inclusions, which cannot be detected through MPI, were brought to, or close to, the surface during the undersize polishing of the crankshaft. If this occurred, a significant stress raiser would have developed and caused the cracking at the fatigue origin site. Except for the inclusions no other causes for the crack initiation were observed. Failure of the crankshaft caused the engine to fail catastrophically.

Although the pilot was proficient in autorotations and probably followed the proper emergency procedures, a suitable emergency landing area was not available to her. The helicopter descended vertically through the trees and crashed, fatally injuring the pilot. The ELT failed to function because it was destroyed in the post-impact fire.

CONCLUSIONS:

Findings:

1. The crankshaft contained inclusions.

2. It is possible that the inclusions were brought to, or close to, the surface during the undersize polishing of the crankshaft.

3. The crack initiation resulted from the presence of a metallurgical stress raiser.

4. The pilot experienced a catastrophic engine failure in flight when the crankshaft failed in fatigue.

5. A suitable landing area was not available.

6. The pilot was fatally injured when the helicopter descended through the trees and struck the ground.

Causes:
The crankshaft failed in fatigue, causing the engine to fail. The nature of the terrain precluded a successful autorotational landing.

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HÉLIMAX LTÉE
HUGHES 369D (Helicopter) C-GVYS
RESTIGOUCHE, QUÉBEC
04 JUNE 1988

BRIEF NUMBER: 88-Q0143 (Accident)
LOCAL TIME: 2054 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,200	800
LAST 90 DAYS	120	61

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The helicopter was flying low over the Restigouche River at dusk, heading for Assomption de la Matapédia. During a right-hand turn, the helicopter struck a power line, and strong vibrations were felt in the aircraft. The pilot decided to land; but, before landing, he noticed that the right skid had been torn off. The vibrations were growing more severe, however, and the pilot was forced to land. The helicopter rolled onto its side and suffered heavy damage.

The pilot had been through this area several times before but had never noticed the unmarked wires. As it was very dark, the pilot turned on the landing light of the helicopter from time to time to check his altitude.

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BELL 206B JETRANGER (Helicopter) C-GTCH
LAC RENAULT, QUÉBEC
20 JUNE 1988

REPORT NUMBER: 88-Q0168 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1550 EDT
OPERATION: Contract
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,365	900
LAST 90 DAYS	165	165

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was taking off in the helicopter following refuelling. As the helicopter lifted off, the right skid contacted an upright fuel drum. The helicopter rolled rapidly to the right and came to rest on its right side. The helicopter was substantially damaged, but the pilot escaped unhurt.

The wind was strong and gusty on the day of the accident, and the pilot was aware of a wind warning that had been issued. At the time of the accident, the wind was from 225 degrees at 25 gusting to 40 knots. As the pilot was preparing to take off, the wind was from slightly left of the helicopter's nose; however, just, at lift-off, there was a strong gust from the left which moved the helicopter to the right. When the right skid contacted the fuel drum, which had been left within three feet of the helicopter after refuelling, the helicopter rolled over and went out of control.

The proximity of the barrel and the severity of the gust resulted in the pilot being unable to prevent contact between the right skid and the barrel. Contacting a fixed obstacle with a helicopter skid can produce a phenomenon known as dynamic roll-over, particularly when the collective is applied to climb. Once contact is made, the pilot has little or no control over the destructive sequence, and the helicopter rolls in the direction of the obstacle.

CONCLUSIONS:

Findings:
1. The wind was variable with speeds to 40 knots.

2. A fuel drum had been left too close to the helicopter.

3. At lift-off, the right skid contacted the fuel drum, and the helicopter went out of control.

Causes:
The pilot did not ensure that the area was clear of obstacles, especially considering the prevailing wind conditions.

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REMOTE HELICOPTERS LTD.
AEROSPATIALE AS350B (Helicopter) C-GTAM
SLAVE LAKE, ALBERTA
06 JULY 1988

BRIEF NUMBER: 88-W0131 (Accident)
LOCAL TIME: 2100 MDT
OPERATION: Other – Flood Rescue
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,250	2,500
LAST 90 DAYS	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The helicopter was engaged in a flood rescue operation and was hovering over water while flood victims were climbing on board, when the tail rotor struck the water. The pilot set the aircraft down in water two feet deep with no further damage to the helicopter.

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OKANAGAN HELICOPTERS LTD.
BELL 204B (Helicopter) C-FBHY
URANIUM CITY, SASKATCHEWAN 20 mi E
10 JULY 1988

REPORT NUMBER: 88-C0150 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0830 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,800	410
LAST 90 DAYS	155	130

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	5

HISTORY OF THE FLIGHT:

The aircraft had been chartered to transport and provide support to construction crews who were installing hydro towers in northern Saskatchewan. The rough terrain required the pilot to select landing areas along the cutline as close as possible to where the towers were to be placed, to facilitate the work of the construction crews. The pilot had picked up five passengers and was in a left pedal turn, at a height of approximately 20 feet above the ground, when a loud noise was heard from the tail of the aircraft. The helicopter rotated to the right, and the pilot reduced power, lowered the collective, and managed to touch down with little lateral or forward movement. All six occupants escaped uninjured, but the helicopter was substantially damaged.

PERTINENT INFORMATION:

The hydro towers were being constructed along a cutline 80 feet in width. The centre 40 feet was cleared; the outer 20 feet on each side was covered with the trees and brush that had been felled. There were trees about 20 to 40 feet high on each side of the cutline.

The construction crew had been dropped off at a tower site located on top of a sloping rock formation. When the pilot returned to pick up the crew, he landed about 20 feet below the base of the tower, facing the rock formation. There were 40-foot-high trees to the left of the aircraft, on sloping terrain, and 30-foot-high trees to the right.

The tail rotor, with part of the 90-degree gearbox assembly attached, had separated from the vertical stabilizer and was located outside the cutline, approximately 25 feet from where the aircraft came to rest. Trees in the area had been scarred, and there was a piece of wood in the bent leading edge of the tail rotor.

The tail rotor gearbox housing and drive gears were forwarded to the CASB Engineering Laboratory for a detailed examination of the fractures. The examination revealed that the failures resulted from material overload. There was no evidence of pre-cracking or progressive failure. The gearbox housing had fractured first, followed by damage to the internal parts.

No other aircraft pre-occurrence malfunctions were found. The weather was not a factor, and the pilot was experienced and familiar with the type of operation.

ANALYSIS:

Following the lift-off and left turn, the aircraft must have drifted rearwards, and the tail rotor struck trees. It is possible that the sloping terrain resulted in an illusion of forward movement, and the pilot inadvertently compensated for the phenomenon, allowing the aircraft to drift into the trees. When the tail rotor struck the trees, the gearbox housing failed in overload, and the unit separated from the aircraft.

CONCLUSIONS:

Findings:

1. The aircraft inadvertently drifted rearwards after lift-off, and the tail rotor struck trees.

2. The tail rotor gearbox housing failed in overload following the tree strike.

3. The sloping terrain possibly gave the illusion of forward movement.

Causes:

The pilot did not ensure adequate clearance from the trees.

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AIRSPAN HELICOPTERS LTD.
BELL 206 JETRANGER (Helicopter) C-GJVZ
CAMPBELL RIVER, BRITISH COLUMBIA 25 mi W
22 JULY 1988

REPORT NUMBER: 88-P0149 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0910 PDT
OPERATION: Aerial Photography and Survey
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,700	2,300
LAST 90 DAYS	170	170

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

After a successful landing on a mountain top, the pilot attempted to hover-taxi the helicopter a few feet forward and to the right to a more suitable landing area. As he lifted the helicopter to a low hover, the helicopter suddenly yawed to the right and pitched nose down. The pilot increased collective and applied left pedal but was unable to regain control of the helicopter, and it struck the ground and rolled over. The helicopter was yawing as it rolled over, and the tail boom struck a metal tripod.

The helicopter was on contract to Energy, Mines and Resources, Canada and was being used to transport two geodetic survey personnel and their equipment to the top of Crown Mountain, 23.5 miles west of Campbell River, British Columbia. The landing site was a small area on the mountain top, 6,057 feet above sea level. The weight of the helicopter was estimated at 3,032 pounds, and, at the 6,000-foot level, it was operating just within its in-ground-effect hovering limits.

At the time of the accident, there were no clouds or restrictions to visibility, the temperature was 15 degrees Celsius, and the wind was primarily from the west at about 15 to 20 knots. The pilot noted after the accident that the wind frequently shifted direction up to 180 degrees and that updrafts were present. These same conditions were noted by the investigators who attended the site during the investigation.

While the pilot was repositioning the helicopter, a sudden wind shift or wind gust caused it to yaw to the right and pitch nose-down. Although the pilot reacted to regain control, the helicopter struck the ground before he could do so.

CONCLUSIONS:

Findings:
1. A sudden wind shift or gust caused the helicopter to yaw to the right and pitch nose-down.

2. The pilot was unable to regain control of the helicopter, and it rolled over.

Causes:
An unexpected wind shift or gust caused the pilot to lose control of the helicopter.

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STANDARD AG. HELICOPTER INC.
BELL 47G4 (Helicopter) C-FSNM
FOLEYET, ONTARIO 6 mi N
07 AUGUST 1988

REPORT NUMBER: 88-O/0299 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0830 EDT
OPERATION: Commercial
DAMAGE: Destroyed
PILOT LICENCE: Commercial Helicopter

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	210	40
LAST 90 DAYS	43	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The helicopter was on a contract applying chemical defoliant to a woodlot. After completing a turn at the end of a spray run, the helicopter descended into the trees. During the crash, the cap from the right fuel tank came off, fuel spilled onto the hot engine, and a fire started. The pilot was able to crawl a safe distance from the aircraft before it was consumed by fire.

The weather was perfect for spraying; the winds were calm and the skies were clear. The temperature was 20 degrees Celsius, the relative humidity was 89 per cent, and the density altitude was approximately 3,110 feet.

The pilot was new at the job and was exercising caution by climbing higher than normal to turn at the end of each spray run. At the end of the last run, he added some power and performed a cyclic climb and executed a pedal turn to the left. After rolling out of the turn, he experienced the sensation of falling. Thinking that he was in a downwind condition, the pilot pushed the cyclic forward to accelerate and fly out of the situation; however, when he attempted to level the helicopter at the beginning of his spray run, it continued to descend. The pilot applied full-up collective and power, but he could not stop the descent.

The aircraft was partially consumed by the post-impact fire, but the main and tail rotor blades were undamaged by the fire. Both main rotor blades remained connected to the mast and showed very minor leading edge damage. The tail rotor also remained intact and showed no damage even though it had become entangled in a tree. The absence of significant blade damage is indicative of low rotor speed at the time of impact.

The engine was removed from the accident site and examined. Because of extensive fire damage, a complete evaluation of the engine could not be carried out; however, from the inspection of the engine which could be performed, there was no evidence of pre-impact failures. The pilot stated that the engine was operating normally. There were no apparent pre-impact failures of any of the systems.

The helicopter weighed approximately 2,973 pounds at the time of the accident, and the maximum allowable take-off weight is 2,950 pounds. The Helicopter Flight Manual shows that, given the helicopter weight, the wind and the density altitude, the helicopter required forward speed to maintain flight, when operating out of ground effect. The flight lasted about five minutes, and the pilot stated that there was enough fuel in the helicopter for at least one hour's flight.

In his efforts to maintain an extra margin for error, the pilot prolonged his climb which resulted in a loss of flying speed. During the turn, there was a further loss of airspeed to the point where the helicopter could not remain airborne and so began an uncommanded descent. Recovery from the descent was initiated at an altitude too low to recover fully, and the main rotor rpm was deteriorated by the application of full up-collective in an attempt to arrest the descent.

CONCLUSIONS:

Findings:
1. The helicopter lost forward speed when the pilot performed a prolonged cyclic climb.

2. There was insufficient altitude to recover from the loss of forward speed.

Causes:
The climb and turn were executed in a manner that resulted in a loss of forward speed which was recognized at too low an altitude to allow recovery.

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CORPORATE HELICOPTERS LTD.
BELL 206B JETRANGER (Helicopter) C-FDYR
WILLIAMS LAKE, BRITISH COLUMBIA 72 mi SSW
18 AUGUST 1988

REPORT NUMBER: 88-P0180 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1350 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	12,000	9,000
LAST 90 DAYS	N/A	110

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The pilot was looking for a remote meteorological recording station while cruising at about 6,300 feet above sea level over mountainous terrain. As he approached a ridge, he executed a right turn from a northerly heading, and the helicopter entered an uncontrollable descending spiral. In an attempt to regain control, the pilot lowered the collective. The helicopter descended into trees, and, although the pilot raised the collective to soften the impact, the helicopter struck the sloping ground and rolled over several times. The pilot sustained minor injuries, and the helicopter was substantially damaged.

The pilot reported that the sky was clear, and the wind was from the south at five knots. He had been flying between 80 to 100 feet above ground level at an airspeed of about 25 knots. During his on-scene examination of the helicopter after the crash, the pilot did not detect any impact marks or damage of any kind in the area of the tail boom and rotor. During the recovery operation, the tail boom assembly from the crashed helicopter was inadvertently dropped from a recovery helicopter and could not be relocated.

In the July/August, 1984 edition of *Rotorbreez*, Bell Helicopter addressed the subject of "Low Speed Flight Characteristics" which can result in unanticipated right yaw. In the article it is stated that "unanticipated yaw is the occurrence of an uncommanded right yaw rate which does not subside of its own accord and which, if not corrected, can result in the loss of aircraft control." This phenomenon could have occurred as the helicopter was subjected to a tail wind (weathercock stability) while it was travelling at low airspeed, or during the turn as the helicopter was exposed to a cross-wind from the left (tail rotor vortex ring state).

The recommended procedure for recovery from an unanticipated right yaw is to fully deflect the left pedal and simultaneously move the cyclic forward to increase speed. A reduction in collective, to aid in arresting the yaw rate, should only be considered if there is sufficient room for recovery.

It is probable that the wind condition, relative to the helicopter's direction of flight, induced an unanticipated right yaw and that the pilot's corrective action was too late and inappropriate.

CONCLUSIONS:

Findings:
1. The pilot lost control of the helicopter.

2. The pilot lowered collective at an altitude insufficient for recovery.

Causes:
The reason for the loss of control was not determined. The pilot's action in lowering the collective at an altitude insufficient for recovery may have contributed to the occurrence.

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VANCOUVER ISLAND HELICOPTERS LTD.
McDONNELL DOUGLAS HUGHES 369D
(Helicopter) C-GPSX
MT. MADELY, BRITISH COLUMBIA
19 AUGUST 1988

BRIEF NUMBER: 88-P0182 (Accident)
LOCAL TIME: 1600 PDT
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,490	1,601
LAST 90 DAYS	230	135

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The helicopter was 20 to 30 feet above ground level on final approach to a repeater site located on an unobstructed level area on Madely Mountain, when the engine lost power. The engine restarted, but the pilot could not prevent the helicopter from landing hard. Two rotor blades and the left landing skid were damaged.

The engine driven fuel pump was tested and found to be defective.

INTERNATIONAL HELIFLIGHT SCHOOLS LTD.
HUGHES 269C (Helicopter) C-GEOP
NORTH VANCOUVER, BRITISH COLUMBIA 9 mi N
27 AUGUST 1988

REPORT NUMBER: 88-P0194 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1045 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	350	102
LAST 90 DAYS	148	27

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The helicopter, with the pilot and two passengers on board, departed North Vancouver on a sightseeing flight. During the flight, the passengers requested that the pilot land so they could have a short walk in the mountains. The pilot selected a landing site on a mountain slope, and, after conducting a low-level reconnaissance of the area, he carried out a trial approach. He established that, at 10 feet above ground level (agl) while approaching the landing site at less than five knots, sufficient engine power was available to sustain hovering flight. The pilot then completed a circuit and an approach. As the aircraft neared the landing site, the pilot began to turn right so the tail rotor would be clear of rocky, uneven ground. At about five feet agl, the pilot realized that the main rotor rpm was decaying, and he attempted unsuccessfully to regain the lost rpm by twisting the engine throttle to the full-open position. He discontinued the landing attempt and pitched the aircraft nose-down and followed the contour of a slight downslope in an effort to gain airspeed and main rotor rpm. During this manoeuvre, the left skid struck several rocks, and the helicopter rolled onto its left side. The three occupants, who received minor injuries, exited the aircraft without difficulty. The wind was calm, there was no cloud, the temperature was 20 degrees Celsius, and the altimeter setting was 29.92. The computed density altitude was 6,400 feet.

At a density altitude of 6,400 feet and at its gross weight of 1,720 pounds, the helicopter was capable of hovering out of ground effect provided that sufficient engine power and main rotor rpm was maintained. On this approach, the pilot did not open the engine throttle sufficiently to maintain the rotor rpm as he raised the collective to arrest the descent for the landing. Because the engine was operating at less than maximum rpm, it could not produce enough power to regain the lost rotor rpm when the pilot did fully open the throttle. It is possible that his attention was diverted from maintaining rotor rpm while he was ensuring that there was adequate tail rotor clearance.

CONCLUSIONS:

Findings:

1. The pilot did not advance the engine throttle sufficiently during the final approach to maintain main rotor rpm.

2. Maximum engine power was not available because of the low engine rpm.

Causes:

The pilot did not advance the engine throttle sufficiently to sustain main rotor rpm during the final approach.

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COUGAR HELICOPTERS INC.
BELL 206B JET RANGER (Helicopter) C-GKCH
MARGAREE FORKS, NOVA SCOTIA 7 mi SE
02 SEPTEMBER 1988

REPORT NUMBER: 88-A0223 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2040 ADT (Approximately)
OPERATION: Commercial Non-Revenue
DAMAGE: Destroyed
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,771	1,596
LAST 90 DAYS	141	137

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The helicopter departed the Margaree area of Nova Scotia at 2030 ADT on 02 September 1988, on a repositioning flight to Sydney, Nova Scotia. A ground crew member departed at the same time by road to meet the pilot in Sydney. When the crew member arrived in Sydney at 2315 ADT, the helicopter still had not arrived. The Rescue Coordination Centre was advised, and a Search and Rescue operation was initiated. The helicopter wreckage was found on top of a mountain ridge at 1215 ADT on 04 September. The pilot was fatally injured in the crash.

PERTINENT INFORMATION:

The crash site was located eight miles southeast of the departure point and two miles south of the direct-line route to Sydney. The heading for the direct-line route was 123 degrees magnetic. The wreckage trail was on a heading of 113 degrees magnetic.

The time of the accident could not be established. Three witnesses saw a helicopter flying along the mountain ridge, close to the crash site, around 2030 ADT on the night the helicopter departed. This would correspond to the departure time of C-GKCH. The reported direction of flight was in the general direction of Sydney. However, several other witnesses, living in an area five miles north of the accident site, reported hearing a helicopter later that night. The times of the reported hearings ranged from 2130 to 0040 ADT. No other helicopters were known to be in the area during those times.

C-GKCH departed at dusk; however, it was reported that it was dark within 15 minutes of the departure time. One witness who saw a helicopter flying along the mountain ridge reported that a bright light, which shone down and forward, had been turned on for about 20 seconds and then turned off again.

The forecast weather issued by Environment Canada at 1100 ADT on 02 September was for the area to cloud over during the day with showers developing. It was to remain cloudy with showers overnight and into the next day.

The weather at the time of departure was reported to be overcast, and one witness, who spoke to the pilot just prior to the helicopter's departure, said the pilot estimated the ceiling to be about 2,500 to 3,000 feet. However, residents of the Margaree area said that, in the highlands, squalls can develop quickly, and the weather can close in very rapidly. There was a heavy rain shower reported in the Margaree area around 2130 ADT, one hour after the helicopter departed.

The weather at the Sydney Airport throughout the evening and into the night deteriorated from ceiling 4,500 feet and visibility 15 miles at 1900 ADT to ceiling 700 feet and visibility 10 miles at 2125 ADT. There was no record at the Sydney Airport Flight Service Station of the pilot's receiving a weather briefing prior to departure.

The helicopter main rotor blades started cutting the tops off of 40-foot-high trees at the top of a hollow. As the helicopter continued down into the hollow, the trees were cut off at a lower height. The final two trees struck by the main rotor blades were cut off 20 feet from the bottom. The blades cut cleanly through these trees at an upward angle of 45 degrees. The diameter of the final two trees, where they were cut off, was approximately eight inches. The main rotor head and blades broke off the helicopter after cutting through the last tree.

After the main rotor head and blades broke off, the helicopter travelled 20 feet before striking the ground on its right side. It then travelled another 40 feet before coming to rest and was almost completely consumed by an intense fuel-fed post-crash fire. An intense burn area extended out 30 feet forward of the wreckage, with a lighter fuel spray burn area extending a further 30 feet.

The following components were not consumed by the fire: the engine; the transmission top case with the swashplate and mast attached; the aft portion of the tail boom with the tail rotor drive shaft attached; the tail rotor gearbox with the tail rotor hub and blade assembly attached; the main rotor head and blade assembly; and the spray booms.

An examination of these components determined that they had not failed prior to impact. The flight controls, from the swashplate to the main rotor and from the aft portion of the tail boom to the tail rotor, were intact at the time of impact. The pre-impact condition of the flight controls, from the pilot's station up to the swashplate and back to the tail boom, could not be determined because they were consumed by the fire.

The spray boom extended out on both sides of the helicopter and was slightly wider than the main rotor diameter. It was found in the main wreckage area, and there was no evidence that it struck the trees when the helicopter was descending into the hollow.

The engine was recovered from the crash site, and an engine teardown was carried out. The damage pattern observed during the teardown was consistent with ground impact at high rotational speed. The rotational speed corresponded to a flight condition speed or possibly an overspeed condition. An overspeed would not be unlikely after the main rotor broke off.

Laboratory analysis of a landing light recovered from the wreckage determined that it was on at the time of impact.

The emergency locator transmitter (ELT) was found intact. The arming switch was found in the OFF position.

An examination of the aircraft log books revealed that all the required maintenance inspections had been carried out and that a major inspection had been carried out 77 flight hours prior to the accident. The pilot and the apprentice maintenance engineer who was servicing the helicopter carried out a thorough daily inspection on C-GKCH the day prior to the accident.

The pilot had been involved in the aerial spraying program for approximately one month prior to the accident. During this period, he flew approximately 40 hours. In the two days preceding the accident flight, the pilot had completed an aerial spraying contract in the Margaree area of Nova Scotia. On the day of the accident, he sprayed for approximately 30 minutes, divided between morning and evening flights. He wore a respirator, gloves, and coveralls at all times while flying. He was not involved with the mixing of the herbicide being sprayed nor the loading of it onto the helicopter. No chemicals were aboard the helicopter during the accident flight.

A study was conducted of the herbicide being used to determine if it may have adversely affected the pilot. It was concluded that the herbicide, in normal-use concentrations, is remarkably free of toxicities and that the risk to a person not involved with mixing or handling of the undiluted chemical would be minimal. The autopsy and the toxicological studies did not reveal any evidence that would indicate incapacitation of the pilot at the time of the accident.

There was a local citizens group in the Margaree area who were hostile to the aerial spraying operation being conducted by the helicopter company, and they were trying to get it stopped. The pilot had expressed his concern to the ground crew about the possibility of vandalism to the helicopter if it were left in the Margaree area overnight. He then made the decision to fly to Sydney, remain there overnight, and then fly the next morning to the new spray area, which was across the highlands from Margaree Forks.

The pilot held a valid commercial helicopter pilot's licence and a Class 1 instructor rating. He had also held a Class 1 instrument rating which had expired one month prior to the accident. In the four months preceding the accident, he had logged 14 hours of instrument flying. He also held an instrument instruction endorsement. He had logged 526 hours of night flying during his career.

The investigation revealed that the pilot was recognized as having above-average flying skills. However, his peers felt that he considered himself capable of flying in weather conditions in which other pilots would not fly.

ANALYSIS:

The main rotor was being driven by the engine when it cut through the trees. This was evidenced by the size of the trees cut, the angle of the cuts, and the damage to the main rotor hub and blade assembly.

The fact that no parts of the spray boom were dislodged in the area of the trees cut by the main rotor as well as the path cut through these trees indicated that the helicopter was in a steep right-bank attitude as it crashed into the trees. The length of the wreckage trail and the evidence of fuel being sprayed out 60 feet beyond where the helicopter came to rest indicated that the helicopter was flying at, or close to, cruise speed. Also, the intensity of the fire and the extent of the fuel spray indicated a large quantity of fuel, probably close to full fuel, was aboard when the helicopter crashed.

The landing light was on at the time of impact, indicating that the pilot was trying to establish a ground reference.

The aircraft records indicated that the helicopter had been maintained in the prescribed manner. This, combined with the fact that there were no pre-impact failures found in any of the components that had not been consumed by the fire, suggested that it is unlikely the helicopter crashed as a result of a pre-impact failure.

As no problems were found with the helicopter which could have caused the accident, it is possible that the pilot either became disorientated and lost control of the helicopter, or that he was trying to maintain visual flight and did not see the terrain. As the pilot was experienced in instrument flying, it is unlikely that he became disorientated. Therefore, the most likely cause of the accident is that the pilot was manoeuvring the helicopter toward some perceived visual reference, and, in the darkness and possible deteriorating weather, he unknowingly allowed the helicopter to descend into the terrain.

CONCLUSIONS:

Findings:

1. The helicopter was flying at cruise speed in a right bank attitude when it struck the trees.

2. The helicopter had been maintained in the prescribed manner, and no pre-impact failures were found.

3. The pilot was qualified to carry out the flight.

4. The weather in the area deteriorated throughout the evening, and the weather in the mountains had a history of deteriorating very rapidly.

5. The planned route was over mountainous terrain.

6. The ELT arming switch was in the OFF position.

Causes:

It is most probable that the pilot was manoeuvring the helicopter toward some perceived visual reference, and, in the darkness and possible deteriorating weather, he unknowingly allowed the helicopter to descend into the terrain.

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RANGER HELICOPTERS CANADA
ROBINSON R22 (Helicopter) C-GCSU
SAULT STE MARIE AIRPORT, ONTARIO 10 mi NE
16 SEPTEMBER 1988

BRIEF NUMBER: 88-O/0375 (Accident)
LOCAL TIME: 1045 EDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,471	591
LAST 90 DAYS	176	79

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The instructor had control of the helicopter and was demonstrating the effects of "flapback" when the tail rotor struck the ground. The tail rotor gearbox and stabilizers separated from the boom, and the helicopter rolled violently to the right and came to rest on its right side.

There were no restrictions to visibility, and the wind was blowing at 5 to 10 knots.

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GREAT SLAVE HELICOPTERS LTD.
BELL 206A JET RANGER C-GSUL
FENTON LAKE, NORTHWEST TERRITORIES
16 SEPTEMBER 1988

BRIEF NUMBER: 88-W0210 (Accident)
LOCAL TIME: 1130 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,785	3,600
LAST 90 DAYS	250	113

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The helicopter had been chartered by the Department of Indian Affairs and Northern Development for the purpose of checking and inspecting mining claims in the Fenton Lake area. One of the Claims Inspectors had been dropped off and was to be picked up one hour later in another location. While attempting to reposition the helicopter in the new location, the pilot performed a right pedal turn which resulted in the tail rotor striking a small spruce tree, causing damage to the tail rotor assembly. The pilot landed the helicopter immediately and shut down.

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CHINOOK HELICOPTERS LTD.
BELL 47G-3B1 C-FYJO
NEAR YARROW, BRITISH COLUMBIA
29 SEPTEMBER 1988

REPORT NUMBER: 88-P0224 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1516 PDT
OPERATION: Specialty Training
DAMAGE: Destroyed
PILOT LICENCE: Student Pilot Permit

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	94	34
LAST 90 DAYS	29	29

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The student pilot was on a solo training flight and had been briefed by his instructor to practise large, left-hand circuits. The student flew to the practice area and successfully completed several left-hand circuits and touchdowns. He then decided to switch to a right-hand circuit, tighten up the pattern, and practise some slow and steep approaches. The pilot slowed the helicopter for the exercise and turned onto final approach at about 200 feet above ground level. After having established the slow speed steep approach, as the pilot raised the collective to decrease the helicopter's rate of descent, the helicopter shuddered, entered a high rate of descent, and began to turn to the right. The pilot noted that the engine manifold pressure was very high and that the main rotor blades seemed to be slowing down. He then lowered collective, pushed forward on the cyclic, and applied more power. The rate of descent was reduced; however, there was insufficient altitude for full recovery, and the pilot, in an attempt to reduce ground impact, applied full-up collective. The helicopter struck the ground, tail first, and slid into a ditch where it was destroyed by fire. The pilot was not injured.

The sky was clear, and the pilot was completing the approach into the light southwesterly wind. Prior to the occurrence, the helicopter was operating normally.

It is possible that, given the slow airspeed and steep approach, a high rate of descent developed such that the helicopter began to settle with power. This condition would explain the increased descent rate that developed when the pilot increased the collective setting. By lowering the collective and applying forward cyclic, the aircraft probably moved out of the adverse flight condition. This action would have facilitated a reduced rate of descent when full collective was applied just prior to impact.

The main rotor rpm decay noted by the student pilot was probably due to a delay in advancing the throttle prior to increasing collective. Such a delay would have aggravated any high descent rate tendency.

CONCLUSIONS:

Findings:
1. The pilot initiated a steep slow speed approach.

2. The helicopter entered a rapid descent.

3. The pilot initiated appropriate recovery control input suitable for a settling-with-power flight condition and was able to abate the descent rate.

4. The main rotor rpm decayed most likely due to insufficient throttle control input prior to collective application.

5. The student pilot had limited experience with slow and steep approach manoeuvres.

6. The student pilot could not regain control before the helicopter struck the ground.

Causes:
The pilot did not make an effective recovery from the settling-with-power flight condition.

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CHURCHILL FALLS LABRADOR CORPORATION LIMITED
BELL 206B (Helicopter) C-FBKH
CHURCHILL FALLS, NEWFOUNDLAND 100 mi NW
10 AUGUST 1988

BRIEF NUMBER: 88-A0208 (Accident)
LOCAL TIME: 1000 NDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	14,542	N/A
LAST 90 DAYS	196	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot landed the helicopter on the edge of the McKenzie River to check a precipitation gauge. The pilot shut down the engine, and, when it had spooled down to about 25 per cent N2, he exited the helicopter. When the pilot stepped out, the left skid slid on a rock, and the tail of the helicopter lowered into the water. Two tail rotor blades were bent as a result.

The pilot reported that the helicopter was not equipped with bear paws and that, had it been so equipped, the skid would not have slid on the rock.

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ENSTROM F28C (Helicopter) C-FBQJ
STEWART LAKE, YUKON
15 AUGUST 1988

BRIEF NUMBER: 88-W0190 (Accident)
LOCAL TIME: 1235 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,008	17
LAST 90 DAYS	17	17

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

As the helicopter was approaching a landing pad on the shore of a lake, in gusty wind conditions, the tail rotor struck the water 40 feet short of the landing pad, and the helicopter settled into the water. The pilot felt that the approach was too low and too slow and that he was slow to react to the deviation from the desired flight path.

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ZORZI AMF-S14-F (Amateur-built) C-FYZO
DESBARATS, ONTARIO 3 mi E
05 MARCH 1988

REPORT NUMBER: 88-O/0083 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1700 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	172	172
LAST 90 DAYS	9	9

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot of the ski-equipped aircraft departed from White Bear Lake for a flight to home base at Gawas Bay. When the aircraft reached an altitude of 3,000 feet above sea level (asl), the pilot reduced power for cruise, and, shortly thereafter, the engine (Lycoming 0290-G-4) began to lose power and shake violently. As the aircraft was flying over dense bush when the power loss occurred, the pilot reduced power to idle rather than shut down the engine. During the approach to land in an open field, the pilot observed power lines running across the approach path and made a right turn away from the wires to an another field. Just before landing, the pilot shut down the engine, and the aircraft landed hard on the rough field, coming to a stop on its right wing and nose section.

Lycoming 0-290-G engines, commonly used in non-certificated amateur-built aircraft, were manufactured for the United States Military specifically for ground power applications, and they were never intended for certificated aircraft installations. Some of the engine parts do not meet aircraft standards in design, materials, or manufacturing processes.

Examination of the engine revealed a broken exhaust valve on the number three cylinder; the valve had failed between the head and the stem. Because the engine kept running, the broken valve struck the piston several times, and the piston eventually broke up into small sections, entered the crankcase, and caused severe internal damage to the engine. The valve failed for undetermined reasons.

CONCLUSIONS:

Findings:
1. The engine lost power when the exhaust valve of the number three cylinder failed, substantially damaging the crankcase.

2. The valve failed for undetermined reasons.

3. The aircraft landed hard in a rough field with no power on and came to rest in a nose-down, right-wing-low attitude.

4. The engine type was not approved for certificated aircraft installations.

Causes:
The exhaust valve on the number three cylinder failed for undetermined reasons.

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BIRDMAN CHINOOK 2S (Ultralight) C-IDJP
EDGERTON, ALBERTA
08 MARCH 1988

BRIEF NUMBER: 88-W0040 (Accident)
LOCAL TIME: 1630 MST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	720	680
LAST 90 DAYS	50	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot had climbed to about 100 feet above ground level after take-off when the engine suddenly lost power. The aircraft descended into trees and was substantially damaged.

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SPECTRUM BEAVER RX550 (Ultralight) C-IHTL
ST. ACHILLE, QUÉBEC
16 MARCH 1988

REPORT NUMBER: 88-Q0043 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1450 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Student Pilot Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	28	28
LAST 90 DAYS	4	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

While in cruise flight in a valley, the pilot turned away from a Canadian Armed Forces (CAF) helicopter which was following the ultralight. During the turn, the ultralight struck electrical wires and crashed. The pilot and passenger escaped uninjured.

The student pilot of the ultralight, although not allowed to carry passengers, had his son in the aft seat for a local visual flight rules flight. The flight was carried out in a valley, at an altitude of approximately 50 to 100 feet above ground level (agl), and followed a road bordered by electrical wires.

A CAF helicopter, on a low-level navigation training mission, approached the valley in the same direction of flight as the ultralight. The pilot of the helicopter noticed the ultralight and remained well clear behind and to the left of it. When the pilot of the ultralight noticed the helicopter, he attempted to get away from it and turned sharply to the right toward the electrical wires. During the turn, the ultralight struck the electrical wires, cartwheeled through the wires, and fell into a snow bank. The student pilot and the passenger were wearing helmets and using shoulder harnesses.

The pilot of the ultralight was not expecting to see a helicopter so close, and, although there was no danger of a collision, he decided to turn away from the helicopter. In doing so, he hastily initiated a right turn, during which the ultralight struck the electrical wires. The aircraft's momentum was dissipated as the aircraft cartwheeled through the wires and fell into the snow bank, thus preventing injury to the occupants. Protective gear in the form of a helmet and shoulder harness further enhanced the survivability of the accident.

Ultralight aircraft equipped with dual seats are to be used solely for instructional work with a qualified ultralight instructor on board (Transport Canada Publication – TP193E: Ultralight Privileges).

CONCLUSIONS:

Findings:
1. The proximity of the helicopter worried the student pilot of the ultralight.

2. The student pilot turned sharply toward electrical wires.

3. The ultralight struck the electrical wires.

4. The student pilot did not operate the ultralight in accordance with Transport Canada regulations.

Causes:
The proximity of the helicopter prompted the student pilot to execute an abrupt manoeuvre, which resulted in the ultralight striking the electrical wires.

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AERO CRUISER N23 (Ultralight) C-IHYK
BOIS-FRANCS, QUÉBEC
31 MARCH 1988

BRIEF NUMBER: 88-Q0057 (Accident)
LOCAL TIME: 1715 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	100	100
LAST 90 DAYS	55	55

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The ski-equipped aircraft was descending to land on a lake from which it had taken off earlier when the engine stopped. The pilot attempted to restart the engine but was unsuccessful, and the aircraft crashed into trees.

The pilot had not filled the fuel tank before take-off, and the flight had lasted about 45 minutes. On this type of aircraft, the fuel feed line is located at the aft end of the tank. When the aircraft is in a nose-down attitude, a large quantity of fuel is unusable. The pilot attributed the accident to this factor.

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PELICAN CLUB (Amateur-built) C-GPEJ
BAGOTVILLE, QUÉBEC 4 mi NE
23 APRIL 1988

REPORT NUMBER: 88-Q0082 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1050 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	415	4
LAST 90 DAYS	4	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	1	-

SUMMARY REPORT:

The pilot and the owner of the aircraft were on a familiarization flight. Following a steeply banked left turn about 500 feet above ground level (agl), the pilot lost lateral control of the aircraft and crashed in a field covered with small trees. The passenger was seriously injured.

Weather conditions were not a factor in the accident. A witness observed that the left aileron appeared to be deflected very high over the wing and strong vibrations were causing the wings to shake. Inspection of the wreckage at the scene revealed that the left aileron had rotated upward 152 degrees. The left aileron control rod was torn upward from the slot provided for its motion in the aluminum rear web of the wing. It also produced marks and tears in the lower portion of the wing web, indicating that the aileron rotated downward 40 degrees. The left aileron was disassembled. There were no impact marks or significant distortion that could have been caused by ground impact. The right aileron control rod left a mark indicating a downward rotation of 30 degrees.

Inspection of another Pelican Club, belonging to the designer, revealed that both aileron control rods on the accident aircraft had been attached in different locations. The plans provided to the builder were examined and found to be consistent with his installation. The designer, however, had made a significant modification in the location of the control rod attachments, and the plans for the accident aircraft which were provided to the builder did not reflect this modification.

The Pelican Club uses unmodified frise-type ailerons, that is, the leading edge of the aileron is not rounded. This type of aileron can lead to serious control problems, such as aileron snatch, in which the aileron is violently and uncontrollably rotated upward. This control problem can occur in the following circumstances: rigging the ailerons up from neutral, radical deflection of the ailerons, high speed, and using unbalanced ailerons with the centre of gravity aft of the hinge axis.

The builder, in following the unmodified plans he had received from the designer, attached his aileron control rods one inch closer to the hinge axis than those on the modified model. This resulted in the aggravation of two factors that can lead to aileron snatch: first, the rigging of the ailerons up from neutral; and, second, an aileron deflection 13.7 degrees greater than on the modified aircraft, as verified on the designer's airplane. The combination of the relatively high speed and the fact that the aileron's centre of gravity was located aft of the hinge axis was sufficient to produce aileron snatch, which caused a loss of lateral control and the subsequent crash of the aircraft on the ground.

CONCLUSIONS:

Findings:

1. The ailerons used on the Pelican Club are of the unmodified frise type and are not balanced.

2. The centre of gravity of the ailerons was aft of the hinge axis.

3. The plans provided to the builder did not reflect the modification made to the location of the aileron control rod attachment.

Causes:
The left aileron became inverted over the wing, causing a loss of lateral control.

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BUCANEER SX (Ultralight) UNREGISTERED
HOLLAND LANDING, ONTARIO
08 MAY 1988

REPORT NUMBER: 88-O/0154 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1720 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Ultralight

PILOT HOURS	ALL TYPES	ON TYPE
TOTAL	400	0
LAST 90 DAYS	15	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

After completing an engine run-up and checking the flight controls, the pilot took off and climbed to about 200 feet above ground level (agl) before reducing the power. Shortly after the power reduction, the nose of the aircraft dropped, and the aircraft rolled to the right. The pilot reduced the back pressure on the control column and applied full power; the aircraft continued to descend and struck the ground in a near-level flight attitude.

Earlier in the day, the aircraft had been assembled and flown by the owner and distributor for the aircraft. He flew three or four circuits but did not complete any stall trials. No aircraft abnormalities were reported after the flight by the owner. The aircraft was not registered.

The occurrence pilot was an experienced ultralight pilot, although he had not flown this type of ultralight before. The occurrence ultralight differed from the ultralight he owned in that it had wing flaps, a larger engine, and an eight-foot shorter wing span. During the take-off run, the pilot noted that the aircraft took longer to become airborne than he expected; however, he considered that the engine was operating normally.

Witnesses stated that the climb after take-off was steeper than normal and that the engine did not sound like it was operating at full power. Inspection of the aircraft after the accident indicated that the flight control system functioned normally. There was no evidence found of an engine malfunction; however, the retaining collar on the throttle cable was missing, and the throttle cable was disconnected at the pilot's throttle control. The throttle cable itself was undamaged. It could not be determined whether the throttle cable became disconnected in flight or during ground impact.

There were no official weather observations available for the accident site; however, the winds were reportedly from the south at about 10 knots in visual meteorological conditions.

When the pilot reduced the power at about 200 feet agl, the aircraft stalled. Although the pilot employed the correct stall recovery technique, he was unable to regain control of the aircraft before it struck the ground. It could not be determined when the throttle cable became disconnected; however,if this occurred when the pilot pushed the throttle fully forward, he would not have been able to command full power.

CONCLUSIONS:

Findings:
1. The throttle cable was disconnected at the throttle control.

2. The aircraft stalled shortly after take-off, and the pilot was unable to recover in the altitude remaining.

3. The aircraft was not registered.

Causes:
The pilot stalled the aircraft and was unable to regain control. Recovery from the stall may have been hampered by a disconnected throttle cable.

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ZENITH CH250 (Amateur-built) C-GLGW
BRAMPTON AIRPORT, ONTARIO 5 mi W
14 MAY 1988

REPORT NUMBER: 88-O/0169 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1600 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: None

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,000	150
LAST 90 DAYS	7	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

After completing three touch-and-go landings at the Brampton Airport, the pilot proceeded northwest of the airport on a local flight. While flying at 4,000 feet above sea level (asl) and about 15 minutes out from the airport, the pilot detected a change in engine noise. This was followed by vibration and an increase in oil temperature, and the pilot decided to return to the airport. The engine noise and the vibration continued to increase, and the engine began to lose power as the oil temperature moved into the red unsafe range on the gauge. About five miles from the airport, the engine stopped, and the pilot force-landed the aircraft in a cultivated field, substantially damaging the aircraft.

The aircraft was equipped with a shoulder harness and a lap belt, which the pilot was using at the time of the accident.

The aircraft engine had accumulated a total time of 2221.4 hours when it was installed in the occurrence aircraft. After approximately 19 hours of operation in the Zenith, the owner decided to have the engine overhauled because of high oil consumption and metal in the oil system. During overhaul, the crankshaft was found to be worn beyond the manufacturer's tolerances and was sent to an automotive shop for chrome plating.

The engine was not overhauled at an approved aircraft overhaul shop, nor was this a requirement as it was installed in an amateur-built aircraft.

The pilot had been medically assessed unfit to hold any type of licence in 1986 and, as a result, did not possess a valid pilot licence at the time of the accident.

Teardown of the engine revealed that the crankshaft had failed in the cheek-to-journal forward fillet of the fourth connecting rod journal. The failed crankshaft was sent to the Canadian Aviation Safety Board Engineering Laboratory for examination and analysis.

A chrome layer was found on the number four journal surface, 0.005 inch thick and extending completely into the fillet area. Microscopic examination of the journal adjacent to the fracture surface revealed a pattern of surface microcracks typical of a chrome-plating layer. No evidence of overheating or lack of lubrication was observed on the crankshaft journal. The journal's dimensions were within the manufacturer's limits.

Microcracks are inherent to chrome plating and fatigue-initiation sites. Chrome plating in a fillet area is particularly detrimental to strength, as it creates a severe stress concentration in a highly stressed area. For this reason, chrome plating is not authorized by the crankshaft manufacturer as a repair.

The inherent microcracks in the chrome plate probably initiated the multiple fatigue cracks in the journal fillet radius of the number four connecting rod journal, as this is a highly stressed area. The crankshaft failed as a result of the fatigue cracks, causing the engine to stop.

CONCLUSIONS:

Findings:

1. The aircraft engine stopped during cruise flight.

2. The aircraft was substantially damaged during the forced landing.

3. The crankshaft failed in fatigue probably initiated by microcracks in the chrome-plating crankshaft repair which extended into the connecting rod journal fillet.

4. Chrome plating of the engine crankshaft was not a repair authorized by the crankshaft manufacturer.

5. Engines installed in amateur-built aircraft are not required to be overhauled or certified by an approved overhaul facility.

6. The pilot was not in possession of a valid pilot licence at the time of the accident.

Causes:

The crankshaft failed in fatigue.

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ICA LARK GLIDER IS-28B2 C-GARQ
ARRISS, ONTARIO
28 MAY 1988

BRIEF NUMBER: 88-O/0192 (Accident)
LOCAL TIME: 1606 EDT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	425	70
LAST 90 DAYS	18	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

In preparation for take-off, the glider was positioned correctly behind the tow plane, and the tow plane commenced the take-off roll. After an approximate 400 foot ground roll and prior to reaching flying speed, the glider began to weathercock. The left wing dropped and struck the tall grass bordering the airstrip, and the glider started to ground loop. The instructor took control and released the glider from the tow plane, but he was unable to regain directional control. The aircraft ground looped, and the undercarriage and wings were damaged.

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BIRDMAN CHINOOK WT (Ultralight) C-IDTF
FORT ASSINIBOINE, ALBERTA
28 MAY 1988

BRIEF NUMBER: 88-W0108 (Accident)
LOCAL TIME: 2100 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	128	128
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was conducting a local flight when he encountered a squall and returned to the airstrip. While touching down in gusty wind conditions, the pilot landed hard, resulting in substantial damage to the aircraft.

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SCHWEIZER SGS2-33A C-GIIB
HANOVER, ONTARIO
29 MAY 1988

REPORT NUMBER: 88-O/0193 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1550 EDT
OPERATION: Private – Other
DAMAGE: Substantial
PILOT LICENCE: Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	49	44
LAST 90 DAYS	6	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	1	-

SUMMARY REPORT:

The glider was on a local public relations flight. On approach to runway 19 at Hanover Airport, the aircraft collided with an embankment approximately 100 feet short of and about nine feet lower than the runway. The aircraft bounced into the air and dropped to the ground where it came to rest in an upright position, approximately 203 feet from the runway threshold and slightly to the west of the extended runway center line.

The winds were reported to have been light from the northwest, subjecting the aircraft to a slight quartering tail wind from the right while on final approach. The pilot had flown the glider to a position on final from which he estimated he would be able to touch down as close as possible to the "numbers" which were 50 feet from the displaced threshold. He reported that the aircraft then drifted east of the approach path and encountered a downdraft and lost airspeed. He pushed the control stick forward to regain airspeed, and, when he saw that the aircraft was going to collide with the embankment, he pulled back on the stick to raise the nose. The pilot reported that the controls of the aircraft were sluggish during this time. The aircraft hit the ground, then bounced into the air to a height about 10 feet above the runway surface level, and dropped to the ground in a near level attitude. The initial impact was to the east of the runway center line and approximately 20 degrees off the runway heading.

This aircraft was equipped with seat cushions designed by Defence and Civil Institute of Environmental Medicine (DCIEM) and recommended by Aviation Safety Advisory 70139: Seat Cushions Schweizer SGS 2-33A. Previous accidents involving Schweizer aircraft that did not have these cushions installed resulted in serious back injuries, even though the aircraft sustained no damage.

During the final approach, the pilot descended to an altitude that he thought would allow him to flare the glider over the clearway on the north end of the runway and touch down as close as possible to the runway "numbers." This approach plan did not leave any margin for error or any unexpected event. When the aircraft drifted east of the extended runway centre line and entered a downdraft, the pilot attempted to extend his glide by pulling back on the control stick. This caused a decrease in airspeed to the point of a stall. The DCIEM designed seat cushions were instrumental in preventing more serious injuries.

CONCLUSIONS:

Findings:

1. The pilot was attempting to touch down as close as possible to the runway "numbers."

2. Pilots were encouraged to land "on the numbers."

3. The aircraft flew into a downdraft on short final.

4. The pilot attempted to extend his glide to the runway.

5. The pilot allowed the aircraft to stall, with insufficient altitude to recover.

6. The seat cushions installed in the aircraft were instrumental in preventing more serious injuries.

Causes:
The pilot allowed the airspeed to decrease to the point of a stall while attempting to extend his glide to the runway.

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SKYTREK SKYSEEKER MKII (Ultralight) C-ICAF
SCHIST LAKE, MANITOBA
26 JUNE 1988

BRIEF NUMBER: 88-C0134 (Accident)
LOCAL TIME: 1615 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	200	50
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot/owner was conducting a test flight on his ultralight after installing a set of Aquamaster fiberglass floats. No rigging or installation instructions from the float manufacturer were available, nor was there any information available as to the compatability of the floats with this type of ultralight. The pilot installed them using instructions received from the previous owner of the floats.

The pilot conducted high speed taxi tests prior to takeoff and did not encounter any control difficulties.

After take-off, the pilot noted that rudder control was not as responsive as when the aircraft was in the wheel configuration. At 300 feet above the surface, a turn to the left was initiated, and the left wing suddenly dropped. The aircraft descended towards the lake, but the pilot managed to gain control using opposite rudder and full opposite aileron. The pilot levelled the ultralight, and the left wing again dropped. The pilot again managed to regain control and decided to land straight ahead. On landing, the ultralight hit the water hard, and the bottom of one of the floats split open and started to sink. The pilot managed to evacuate and swim to shore.

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RAND ROBINSON KR2 (Amateur-built) C-GUNV
ST. ANDREWS AIRPORT, MANITOBA
26 JUNE 1988

BRIEF NUMBER: 88-C0133 (Accident)
LOCAL TIME: 0710 CDT
OPERATION: Private Testing
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	218	2
LAST 90 DAYS	1	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft was being flown for the first time. After take-off, at an altitude of 200 feet above the ground, the pilot noted that the engine temperature was excessively high. He completed a tight circuit and touched down approximately three-quarters of the way down the 3,000-foot asphalt runway. When it appeared that the aircraft would not stop on the runway, the pilot steered the aircraft off the side of the runway into tall grass. The right wheel struck a runway marker light, and the right landing gear leg broke off.

The engine overheat problem was traced to a faulty thermostat.

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WAG-AERO CUBY (Amateur-built) C-GDJI
FLY LAKE, ONTARIO
03 JULY 1988

BRIEF NUMBER: 88-C0139 (Accident)
LOCAL TIME: 1500 CDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,550	190
LAST 90 DAYS	50	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot of the float-equipped amateur-built aircraft was taking off from a small lake. The winds were strong and gusty, and the direction of take-off was into hilly, treed terrain. Immediately after take-off, the aircraft was buffetted by the winds, and it rolled to the left. The pilot was unable to regain control before the aircraft struck the trees at the edge of the lake and crashed.

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PITTS SPECIAL CF-XLG
CRANBROOK AIRPORT, BRITISH COLUMBIA
17 JULY 1988

BRIEF NUMBER: 88-P0142 (Accident)
LOCAL TIME: 1840 PDT
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	919	300
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

During roll-out after landing at Cranbrook, British Columbia, the left brake failed. The aircraft ground looped to the right, the left landing gear collapsed, and the left wing touched the ground.

The pilot reported that the left brake anchor bolts were seized in the torque plate assembly, preventing the brake from adjusting for brake lining wear. The brakes had been recently serviced.

* * * * *

E. DONALD MCFEE ZENITH CH 250
(Amateur-built) C-GVEM
LIONS HEAD, ONTARIO
28 JULY 1988

REPORT NUMBER: 88-O/0285 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1130 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	33	20
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger departed from the grass runway at Lions Head, Ontario on a local visual flight rules (VFR) flight. After an uneventful flight, the pilot returned to land, and, during the touchdown, the nose gear collapsed. The aircraft remained within the boundary of the runway as it slid to a stop. Both occupants were uninjured and exited the aircraft without difficulty.

Examination of the nose gear revealed that a crack had developed on a welded section at the top of the gear leg.

The total time on the aircraft was 83 hours, with the majority of the flights from grass strips, which put increased stress on the nose gear.

The previous owner, who had built the aircraft from a kit five years before the accident, had obtained the design specifications with the kit from the manufacturer; however, the weld that he made on the nose gear leg was not of the thickness specified by the manufacturer and was not strong enough to withstand the imposed loads. After numerous operations on grass fields, the weld failed, and the nose gear collapsed.

CONCLUSIONS:

Findings:
1. The weld on the nose gear was of insufficient thickness.

2. The nose gear failed during the landing.

Causes:
The weld on the nose gear was of insufficient thickness, and the nose gear failed.

* * * * *

ICA IS-28M2 (Hang Glider) C-GBEO
SAINT-HONORÉ, QUÉBEC
31 JULY 1988

BRIEF NUMBER: 88-Q0220 (Accident)
LOCAL TIME: 1518 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	122	34
LAST 90 DAYS	20	18

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The powered hang glider was in cruise flight at 1,800 feet, five miles west of the Saint-Honoré Airport when the engine misfired several times and began to lose power. The pilot decided to turn around and return to the departure airport. He reactivated the boost pump, and power increased for a few moments, then dropped off again. Realizing that there was insufficient altitude to reach the Saint-Honoré Airport safely, the pilot initiated a precautionary approach for a landing in a field. During the flare, the left wing struck the ground, and the aircraft ground looped. There were no injuries.

* * * * *

JOHNSTON MUSTANG II (Amateur-built) C-GBCJ
RED DEER, ALBERTA 19 mi S
31 JULY 1988

BRIEF NUMBER: 88-W0160 (Accident)
LOCAL TIME: 1800 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,064	102
LAST 90 DAYS	23	21

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was landing the aircraft on his farm strip when he lost directional control and veered off the runway. A rain shower had left the turf strip wet and slippery, causing the brakes to be ineffective. The short-coupled conventional landing gear aircraft requires the use of differential brakes to maintain directional control during the landing roll.

* * *

SCHWEIZER SGS 2-33A GLIDER C-GCLG
PICTON AIRPORT, ONTARIO
05 AUGUST 1988

BRIEF NUMBER: 88-O/0300 (Accident)
LOCAL TIME: 1230 EDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Student Pilot

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	7	7
LAST 90 DAYS	7	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

While on the downwind leg, the pilot entered a downdraft and accelerated by lowering the aircraft nose to penetrate the descending air. The pilot modified the circuit by flying the downwind leg closer to compensate for the loss of altitude. When she turned onto final, the pilot lowered the nose to lose altitude, instead of deploying the spoilers. As a result of the increased airspeed, the glider landed long, eventually overrunning the runway and striking some rocks and trees before coming to rest.

* * *

MURPHY AVN RENEGADE C-IFFE
ERSKINE, ALBERTA
13 AUGUST 1988

REPORT NUMBER: 88-W0181 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2125 MDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	89	46
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot took off from his private farm strip just after sunset to conduct a demonstration flight for a gathering of family and friends. After lift-off, the aircraft climbed to about 500 feet above ground level (agl). The aircraft approached the gathering from a westerly direction, descended to an altitude of about 125 feet agl, and rolled to an inverted attitude. It continued in level flight for about 100 feet, and then the nose dropped rapidly. The aircraft struck the ground in an upright, wings-level, 40-degree nose-down attitude, while heading in a westerly direction. The pilot was fatally injured, and the aircraft was destroyed.

The aircraft was purchased by the pilot in kit form. It is a bi-plane stressed to +10 and –6G. An optional second fuel tank was fitted into the upper wing, and a five-point aerobatic restraint harness had been installed in the aft cockpit, which is where the pilot sits. The engine (Rotax 532) had not been fitted with any system for operation during inverted flight or prolonged negative G manoeuvres. The pilot had flown the aircraft about 46 hours and had performed aerobatic manoeuvres during several flights.

During the month preceding the accident, the Swiss and German National Aerobatic teams were based at Stettler, a short distance from the pilot's residence. The pilot, who had not received any formal aerobatic training, had taken an interest in the aerobatic teams' practice sessions. The pilot continued to perform aerobatic sequences, although he was not known to conduct his manoeuvres at extremely low altitudes. It could not be determined if he had practised inverted flight manoeuvres before the accident flight.

When the aircraft struck the ground, the structure from the front cockpit forward was crushed. Two of the cables which secured the shoulder harness to the airframe failed; one cable failed in tension, and the nicopress sleeve used to secure the end of the other cable to the airframe had been improperly crimped, allowing the cable to run free during deceleration at impact. During laboratory tests, two test sections of the cable failed at a load of 944 pounds, which was below the manufacturer's specification limit of 970 pounds.

Slash marks in the earth and damage to the propeller indicated that the engine was producing substantial power at impact.

When the pilot rolled the aircraft to an inverted attitude, he did so at an altitude which left no room for error. Because of lack of experience and formal aerobatic training, the pilot may have become disoriented during the inverted flight manoeuvre. He may have believed that his altitude was sufficient for him to complete a pull-through, thus reversing his direction of flight.

Although it was evening, the sky was clear; the lighting conditions were good and were considered not to have contributed to the accident.

The failure of the pilot's shoulder harness left his upper torso unrestrained and contributed to the severity of his injuries.

CONCLUSIONS:

Findings:

1. The pilot was flying the aircraft in an inverted attitude at low altitude.

2. The nose dropped sharply, and the aircraft struck the ground in a 40-degree nose-down attitude.

3. The pilot had not received formal aerobatic training.

4. The pilot's shoulder harness failed.

Causes:

The pilot attempted low-level aerobatic manoeuvres without proper training.

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SCHWEIZER 222 (Glider) C-FPHQ
SAINT-ESPRIT, QUÉBEC
20 AUGUST 1988

BRIEF NUMBER: 88-Q0242 (Accident)
LOCAL TIME: 1454 EDT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	171	38
LAST 90 DAYS	7	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The student pilot, who was at the controls, and his instructor were returning from a training flight. The winds appeared light, and the decision was made to land downwind on the runway. The instructor did not notice that the winds were increasing; when the aircraft was on the base leg, the winds were stronger than expected. As the wind was carrying the glider toward the runway, the speed brake was fully deployed. The instructor took over the controls and attempted to line up with the end of the runway by executing a side-slip. Because of the aircraft's altitude and high speed and the obstacles at the end of the runway, it would have been dangerous to land, and the instructor was forced to touch down on an unprepared field nearby. As the approach speed was too high, the roll-out too long, and the braking ineffective, the glider came to rest in a ditch at the end of the field. No one was injured; the aircraft was substantially damaged.

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SPECTRUM RX-550 BEAVER C-IDVL
INDUS, ALBERTA
25 AUGUST 1988

BRIEF NUMBER: 88-W0194 (Accident)
LOCAL TIME: 2000 MDT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Commercial Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	210	143
LAST 90 DAYS	33	33

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

Shortly after take-off, the engine (Rotax 503) lost power. The aircraft was unable to maintain altitude, and the pilot force-landed in a wheat field. The pilot reported that the loss of power was traced to a defective ignition condensor.

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CUBY SPORT TRAINER C-FAWM
LAKE SÉBASTIEN, QUÉBEC
26 AUGUST 1988

BRIEF NUMBER: 88-Q0259 (Accident)
LOCAL TIME: 1715 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	120	30
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot and passenger were leaving on a fishing trip. The first take-off was rejected because there was insufficient distance, and the pilot taxied to a position further back to increase the distance available for the second take-off. After lift-off, the aircraft failed to climb. The pilot initiated a left turn to remain over the water, and the aircraft stalled. The pilot and passenger were not injured; the aircraft was substantially damaged. The pilot later said that the take-off weight was high and the centre of gravity was aft. The indicated airspeed in the turn was low.

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GLASFLUEGEL LIBELLE 201B (Glider) C-GPRS
CONESTOGA LAKE, ONTARIO
07 SEPTEMBER 1988

BRIEF NUMBER: 88-O/0360 (Accident)
LOCAL TIME: 1515 EDT
OPERATION: Flying Club Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,121	600
LAST 90 DAYS	88	88

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The glider was on a cross-country flight from Rockton to Fergus, Ontario, with a possible return to Rockton. Since the lift conditions were poorer than anticipated, the glider began to lose altitude, and the pilot chose a field for landing. Head wind and hydro lines on the approach path forced the pilot to turn to the left and carry out a downwind landing. When the spoilers were extended, the nose lowered, and the aircraft dropped 15 feet to the ground. The aircraft was substantially damaged on impact.

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SEAHAWK (Amateur-built) C-GUER
NAMAO AIRPORT, ALBERTA
11 SEPTEMBER 1988

BRIEF NUMBER: 88-W0205 (Accident)
LOCAL TIME: 1155 MDT
OPERATION: Private Testing
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,800	5
LAST 90 DAYS	205	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was conducting a series of take-offs and landings on the 14,000-foot runway to determine the effectiveness of vortex generators that had been added to the amateur-built amphibian. On touchdown, the fibreglass nose gear strut failed, and the aircraft skidded on the stub, coming to rest off the edge of the runway. The owner indicated that the aircraft did not incorporate the latest steel nose gear strut, which had been developed because of numerous failures of this strut on other aircraft of the same type.

* * * * *

Annex 1

List of Reports by Aircraft Manufacturer and Type

REPORT BY AIRCRAFT MANUFACTURER AND TYPE

MANUFACTURER	TYPE	REPORT NUMBER	PAGE
AERO CRUISER	N23	Q0057	122
AERONCA	7AC	Q0186	97
		Q0281	104
	7BCM	W0098	68
	11AC	P0065	61
	15AC	P0056	60
AEROSPATIALE	AS350B	W0131	111
BEECH	23	P0143	76
		Q0065	22
		Q0077	23
	24	O0186	66
	35	C0151	75
BEECHCRAFT	23	C0044	53
	65	C0087	5
BEECHCRAFT KING AIR	100	W0118	45
BELL	47	O0299	113
		P0224	119
	204	C0150	111
	206	A0208	120
		A0223	116
		P0034	107
		P0149	112
		P0180	114
		Q0168	110
		W0210	118
BELLANCA CITABRIA	7ECA	W0067	61
BIRDMAN CHINOOK	WT	W0108	125
	2S	W0040	121
BOEING	727	Q0131	13
	737	A0146	6
	747	W0113	1
BRISTOL	170 MK31	P0125	44
BRITTEN NORMAN	BN2A	C0135	17
BUCANEER	SX	O0154	123
CANADAIR	CL 215	C0138	107
CESSNA	120	Q0113	64
	150	A0196	79
		A0227	85
		A0232	85
		C0056	55
		C0108	71
		C0117	26
		C0142	27
		O0108	58
		Q0072	23
		W0095	68
		W0184	28
	152	C0097	26
		O0214	26

MANUFACTURER	TYPE	REPORT NUMBER	PAGE
CESSNA (cont'd)		O0324	29
		Q0235	30
	170	C0052	53
		O0202	70
	172	C0049	22
		C0064	57
		C0148	74
		P0068	35
		P0159	27
		P0188	30
		Q0035	53
		W0219	87
	177	O0099	55
	180	C0084	90
		O0168	36
		P0032	88
		P0078	62
		P0087	90
		P0101	90
		P0103	66
		P0106	94
		P0109	25
		Q0195	99
		W0084	37
		W0148	76
		W0221	87
	182	C0083	63
		C0096	70
		C0162	28
		O0147	62
		Q0104	63
		W0150	77
	185	C0043	31
		C0051	9
		C0069	34
		C0071	11
		C0076	62
		C0175	51
		C0191	85
		O0343	101
		P0111	40
		P0202	101
		P0223	21
		Q0144	94
		Q0146	96
		W0053	57
		W0063	88
		W0071	89
		W0081	64
		W0094	95
		W0217	86

MANUFACTURER	TYPE	REPORT NUMBER	PAGE
CESSNA (cont'd)	188	C0119	41
		O0275	48
	206	A0192	17
		C0047	9
		C0090	39
		C0152	17
		O0273	99
		Q0046	32
		Q0236	100
	207	W0121	16
	210	W0090	67
	310	C0067	9
	401	C0063	10
	421	A0205	80
CHAMPION	7EC	C0120	72
		O0215	96
	7GC	A0128	65
CONVAIR	L-13	W0143	75
CUBY SPORT	TRAINER	Q0259	131
DE HAVILLAND	DHC-2	O0203	15
		O0243	98
		P0061	11
		Q0167	42
		Q0217	47
	DHC-3	C0046	31
		C0086	91
		C0109	38
	DHC-6	W0082	12
		W0196	52
	DHC-7	P0097	4
	DHC-8	P0121	8
DOUGLAS	DC-3	O0247	46
		W0065	3
ENSTROM	F28C	W0190	120
FLEET	80	Q0134	93
GLASFLUEGEL LIBELLE	201B	O0360	131
GRUMMAN	CS2F-1	P0122	41
	G164	C0163	49
		Q0226	50
HAWKER SIDDELEY	HS-748	O0170	36
		Q0047	33
HUGHES	269C	O0194	108
		P0194	115
	369D	Q0143	110
		W0066	108
ICA	IS-28B2	O0192	125
	IS-28M2	Q0220	128
JETSTREAM	31	O0089	2
JOHNSTON	MUSTANG II	W0160	129
LAKE	LA-4	O0180	92
		O0387	104

MANUFACTURER	TYPE	REPORT NUMBER	PAGE
LAKE (cont'd)		Q0207	100
LUSCOMBE	8F	O0332	83
MAULE	M5	C0157	77
	M5	Q0261	103
McDONNELL DOUGLAS HUGHES	369D	P0182	115
MOONEY	M20G	O0109	60
		O0345	83
MURPHY AVN	RENEGADE	W0181	129
PELICAN CLUB		Q0082	122
PIPER	J-3	C0199	105
		O0148	89
		O0255	75
	PA-11	Q0153	96
	PA-12	C0054	88
		O0264	73
		P0107	67
		Q0194	99
	PA-18	P0151	76
		Q0255	84
		W0101	69
		W0202	102
	PA-23	A0068	55
		A0094	34
		P0200	20
	PA-24	P0098	24
		P0193	83
	PA-25	C0164	78
		C0176	82
		W0162	50
	PA-28	C0143	73
		C0197	31
		Q0127	65
	PA-31	C0123	43
		C0180	19
		P0105	39
		P0179	18
	PA-32	C0124	73
PITTS	SPECIAL	P0142	127
RAND ROBINSON	KR2	C0133	127
REPUBLIC	RC-3	P0104	93
ROBINSON	R22	O0375	118
SCHWEIZER	164	C0160	48
		C0170	51
	222	Q0242	130
	233	O0193	125
		O0300	129
	TEAL	O0329	51
SEAHAWK		W0205	132
SKYTREK SKYSEEKER	MKII	C0134	126
SPECTRUM	RX-550	Q0043	121
		W0194	131

MANUFACTURER	TYPE	REPORT NUMBER	PAGE
STINSON	108	Q0268	104
	HW-75	Q0070	61
TAYLORCRAFT	BC12	C0100	96
		P0043	56
		P0168	78
VICKERS-ARMSTRONG	VC-10	A0138	106
WAG-AERO	CUBY	C0139	127
ZENITH	CH-200	C0168	79
	CH-250	O0169	124
		O0285	128
ZORZI	AMF-S14-F	O0083	120

Annex 2

List of Reports by Provinces/Territory of Occurrence

REPORTS BY PROVINCE/TERRITORY OF OCCURRENCES

PROVINCE/TERRITORY	DATE	REPORT NUMBER	PAGE
Alberta	88-03-08	W0040	121
	88-05-13	W0081	64
	88-05-26	W0090	67
	88-05-28	W0094	95
	88-05-28	W0108	125
	88-05-29	W0095	68
	88-05-29	W0098	68
	88-06-22	W0118	45
	88-07-06	W0131	111
	88-07-25	W0150	77
	88-07-26	W0143	75
	88-07-31	W0160	129
	88-08-03	W0162	50
	88-08-13	W0181	129
	88-08-14	W0184	28
	88-08-25	W0194	131
	88-09-11	W0205	132
	88-09-20	W0217	86
	88-10-01	W0219	87
	88-10-01	W0221	87
British Columbia	88-02-27	P0032	88
	88-02-28	P0034	107
	88-03-19	P0043	56
	88-03-30	W0053	57
	88-04-03	P0056	60
	88-04-06	P0061	11
	88-04-10	P0065	61
	88-04-16	P0068	35
	88-04-27	P0078	62
	88-05-11	P0087	90
	88-05-21	P0101	90
	88-05-22	P0097	4
	88-05-22	P0098	24
	88-05-25	P0103	66
	88-05-25	P0104	93
	88-05-26	P0105	39
	88-05-27	P0106	94
	88-05-29	P0107	67
	88-05-30	W0101	69
	88-05-31	P0109	25
	88-06-02	P0111	40
	88-06-17	P0121	8
	88-06-17	P0122	41
	88-06-21	P0125	44
	88-07-17	P0142	127
	88-07-18	P0143	76
	88-07-22	P0149	112
	88-07-24	P0151	76
	88-07-28	P0159	27

PROVINCE/TERRITORY	DATE	REPORT NUMBER	PAGE
British Columbia (cont'd)	88-07-30	P0168	78
	88-08-18	P0179	18
	88-08-18	P0180	114
	88-08-19	P0182	115
	88-08-22	P0188	30
	88-08-27	P0194	115
	88-08-28	P0193	83
	88-08-30	P0200	20
	88-09-02	P0202	101
	88-09-28	P0223	21
	88-09-29	P0224	119
Manitoba	88-02-29	C0043	31
	88-03-02	C0047	9
	88-03-05	C0049	22
	88-03-07	C0054	88
	88-04-12	C0071	11
	88-04-21	C0076	62
	88-05-23	C0087	5
	88-06-16	C0117	26
	88-06-17	C0119	41
	88-06-18	C0120	72
	88-06-19	C0124	73
	88-06-26	C0133	127
	88-06-26	C0134	126
	88-06-27	C0135	17
	88-06-29	C0138	107
	88-07-04	C0142	27
	88-07-15	C0152	17
	88-07-29	C0160	48
	88-07-31	C0163	49
	88-07-31	C0164	78
	88-08-15	C0176	82
	88-08-21	C0180	19
	88-09-25	C0197	31
New Brunswick	88-08-03	A0196	79
	88-08-07	A0205	80
	88-09-17	A0232	85
Newfoundland	88-04-12	A0094	34
	88-05-14	A0128	65
	88-05-30	A0138	106
	88-06-15	A0146	6
	88-07-31	A0192	17
	88-08-10	A0208	120
	88-09-10	A0227	85
Northwest Territories	88-04-15	W0065	3
	88-04-17	W0066	108
	88-04-29	W0071	89
	88-05-14	W0082	12
	88-06-26	W0121	16
	88-08-28	W0196	52
	88-09-16	W0210	118

PROVINCE/TERRITORY	DATE	REPORT NUMBER	PAGE
Nova Scotia	88-03-17	A0068	55
	88-09-02	A0223	116
Ontario	88-03-04	C0051	9
	88-03-05	O0083	120
	88-03-07	O0089	2
	88-03-10	O0099	55
	88-04-02	O0108	58
	88-04-04	O0109	60
	88-04-09	C0069	34
	88-05-03	O0147	62
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	88-05-22	C0086	91
	88-05-22	C0109	38
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	88-07-03	C0139	127
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	88-07-10	O0255	75
	88-07-19	O0273	99
	88-07-20	O0275	48
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	88-09-11	C0191	85
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	88-06-12	Q0153	96
	88-06-19	Q0167	42
	88-06-20	Q0168	110
	88-07-01	Q0186	97
	88-07-09	Q0194	99
	88-07-13	Q0195	99
	88-07-13	Q0217	47
	88-07-22	Q0207	100
	88-07-31	Q0220	128
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Annex 3

The following reports have not been issued in this publication, but are available upon request.

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AERO COMMANDER	681	C0107
AERONCA	7CCM	O0183
	15AC	Q0091
AEROSPATIALE	AS350	Q0243
ARBONIA-FORST FIREBIRD	M-1	O0379
BEECH	23	C0156
	95	Q0142
BELL	47	C0158
		P0033
	206	A0207
		A0237
		C0093
		P0084
BELLANCA	7GCBC	Q0100
BENSON AIRCRAFT	B-80	A0163
BRITTEN-NORMAN	BN-2A-21	A0212
CESSNA	150	C0167
		O0286
		O0334
		Q0045
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		O0294
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	172	A0149
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		P0212
		W0097
	175	W0154
	180	A0168
	182	P0090
		W0174
	185	C0089
		C0146
		O0316
		W0047
		W0183
	188	W0109
	206	C0092
		C0095
		O0309
		P0094
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	210	C0149
	305	P0150
	310	W0088
	337	P0213

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CESSNA (cont'd)	421	P0039
CHAMPION	7GCB	P0047
CONSOLIDATED LAKE	LA-4	O0388
DE HAVILLAND	DHC-2	W0218
	DHC-6	W0061
FISHER	FP101	A0198
FOUND	FBA-2C	C0057
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GRUMMAN	AA-1	O0344
		Q0139
	AA-5	O0179
HELIO COURIER	H700	W0182
HUGHES	369D	Q0157
		Q0267
JAY HUNT ACRO ZENITH	CH-180	Q0103
LAKE CONSOLIDATED AERONAUTICS	LA4-200	W0091
MAULE MARK IV	220C	W0072
MAULE MV	235C	W0089
MAULE	M-4	Q0251
	M-5	P0141
MONG	SPORT	P0163
MOONEY	M20J	P0205
MURPHY AVIATION	RENEGADE II	O0333
PIPER	PA-18	P0076
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	PA-30	Q0204
	PA-38	A0086
RYAN	NAVION	P0042
SCHLEICHER	ASW-19	P0204
SCHWEIZER	G164B	C0166
SPECTRUM	RX550	W0076
T. KIRKLAND	SF-2A	O0204
TAYLORCRAFT	BC12D-85	Q0102
ULTRAFLIGHT	LAZAIR	P0120

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Manitoba	88-03-08	C0057
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	88-08-02	C0166
	88-08-20	C0179
New Brunswick	88-03-31	A0086
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Newfoundland	88-05-07	A0168
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	88-07-01	A0163
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	88-07-30	O0286	
	88-08-02	O0294	
	88-08-11	O0309	
	88-08-12	O0316	
	88-08-20	O0333	
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Québec	88-03-20	Q0045	
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	88-06-14	Q0157	
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	88-08-22	Q0243	
	88-08-27	Q0251	
	88-09-17	Q0267	
Saskatchewan	88-05-27	C0092	
	88-07-07	C0146	
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Yukon	88-05-23	W0089	